THE SCIENCE OF REFORM: GEOGRAPHY IN BOURBON SPAIN

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Abstract

This dissertation examines how the science of geography informed eighteenth century Spanish governance during the period of concentrated imperial reform associated with the Bourbon monarchs. Following the War of the Spanish Succession (1700-1715), the Spanish monarchy began a reform program to centralize the state, curb monarchial inefficiency, and defend Spanish territorial sovereignty. To fulfill these objectives, the eighteenth century Spanish monarchy incorporated geographic knowledge and associated language and practices into its agenda of reform and process of state centralization. The consequence was a unique Spanish geographic vision – of both the empire and of what constituted the discipline of geography – that brought pragmatism and empiricism to state reform. While there existed a number of competing geographical traditions in eighteenth century Spain, the argument centers on the substantial reforms that cartographic centers in peninsular Spain underwent, especially the difference between the community of "scientific officials" centered at Cádiz and the "studio cartography" of the Royal Academy of History. Ultimately, the piecemeal pursuit of geography during the Caroline period led to inconsistencies in the precision of Spanish cartography that became apparent during the occupation of Spain in 1808 during the Napoleonic Wars (1807-1814).

This dissertation examines the linked histories of reform in governance and reform of the science of geography within Bourbon Spain from 1700 through 1808. While past scholarship has reflected on the Bourbon Reforms from economic, political, and social perspectives, scholars have not looked at geography as a meaningful part of state centralization. This study combines these two avenues of historical inquiry but

foregrounds scientific activities, thus reading the political and economic reforms with a fresh, geographical perspective. While relying on contemporary scholarship on eighteenth century European geography, this study examines how Spain adapted many foreign approaches and epistemologies and finds that these borrowed ways of doing geography resulted in distinct yet syncretic modes of practice.

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> "Life is not what one lived, but what one remembers and how one remembers it in order to recount it." - Gabriel García Márquez, *Vivir para contarla*

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Introduction
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> Geography is one of those sciences which will always require to be perfected. Notwithstanding the pains that have been taken, it has hitherto been impossible to have an exact description of the earth. For this great work, it would be necessary that all sovereigns should come to an understanding, and lend mutual assistance. But they have ever taken more pains to ravage the world than they have to measure it. […] Happily, that which has often been traced by geographers, according to their own fancy, in their closets, is rectified on the spot. In geography, as in morals, it is very difficult to know the world without going from home.[1]

The eighteenth century was a geographical century. Inspired by philosophical trends that demanded empirical observation and rational governance, European governments sent expeditions across the globe to measure its limits. In some instances, as alluded to above by Voltaire, this meant European nations measured their colonial realms with greater precision and set permanent boundaries at the periphery of territorial holdings. In other instances, such as in the Pacific sea, European geographic knowledge expanded to include new continents and people. While the influence of the science of geography was felt across Europe, this dissertation will examine the role of geographic practices in the reform of the global Spanish monarchy.

The Spanish empire – particularly under the Bourbon Monarchy – underwent comprehensive state reforms throughout the long eighteenth century. Reform in Bourbon Spain was guided by ideals of state centralization, the rationalization of governance, and the "modernization" of state policy. Such modernization should not be read through our

[1] Voltaire, *A Philosophical Dictionary*, (London: John and Henry L. Hunt, 1824), Vol. 3, 304-307.

contemporary conception of the word, but, rather, in light of reformers' understanding of "modern." These individuals worked to break the influence of historic institutions in Spain through conscientious restructuring and sought to liberalize the imperial economy by invalidating entrenched noble privileges. Their sense of the modern was defined by its rupture with the past and its emulation of recent advances in science, technology, and governance by other European nations. In this sense, it was undoubtedly a century of significant modernization for the Spanish world.

The death of Carlos II of Spain on 1 November 1700 ended Habsburg rule in Spain. During the hundred years that followed, members of the new Spanish House of Bourbon renovated every aspect of the global Spanish monarchy. It was a century of rapid and profound changes in the Spanish world, and underlying all of these reforms, I will argue, was the science of geography. Geographic science – whether in the visual medium of cartography or the affiliated disciplines of demography and political economy – guided reformers in their objectives, illuminating inefficiencies where they existed and declaring sovereignty over vulnerable imperial peripheries. Although similar efforts were undertaken by virtually every European nation during the eighteenth century, these efforts had a particular character in the Spanish world. Indeed, one of the principal arguments of this dissertation is that there existed a uniquely Spanish geographic vision that informed – and was informed by – the reform movement. The present dissertation explores the ways in which the eighteenth century Spanish monarchy incorporated geographic knowledge, language, and practices into its agenda of reform and process of state centralization.

In order to complete this project I consulted a variety of types of sources, including published ministerial reports, published geographical treatises, field notes and sketch maps prepared by Spanish surveyors, printed maps, and epistolary exchange between geographers and government officials. The majority of my archival work was completed in Madrid, because this dissertation is concerned with the interaction between the science of geography and the project of state reform. When possible, I have consulted accounts by British, French, and Portuguese geographers and government agents in order to contextualize my Spanish sources. By looking at the printed maps and field sketches collected by government ministers, we begin to understand both their interest in various regions and the type of geographical data privileged by the reformist agenda.

The Historiography of Bourbon Spain

The evolution of historical thought regarding Bourbon Spain may be considered as a progression away from the reductionist argument of Richard Herr.[2] Herr sought to find evidence of profound change in Spain emanating from France, leading him to proclaim the 1790s as a watershed moment for reform. In this way, Herr is typical of a historiography that claims that Spanish state reform was a response to the Enlightenment and French Revolution, and identifies such connections with the arrival of 'modern' Spain. This school of thought insufficiently notes, however, that these changes were the culmination of much longer processes and were influenced by a number of factors beyond the notable French ones mentioned earlier. Two historiographical trends diverging from Herr's approach should be highlighted. The first, which I will associate

[2] Richard Herr, *The Eighteenth-Century Revolution in Spain* (Princeton: Princeton University Press, 1958).

with the work of Francisco Sánchez-Blanco, argues for a temporal elongation of the reform movement, describing the introduction of new political, social, and scientific ideas to Spain before the ascension of Charles III.[3] The second trend, which I will associate with Gabriel Paquette, seeks to complicate the Bourbon Reform narrative, arguing for a more nuanced view of 'reform.'[4]

When considering the broad, trans-oceanic scope, the historiography of Bourbon Spain hinges on three major contestations. First, to what degree can the reign of the late Bourbon monarchs be characterized as "enlightened absolutism?" Second, where did the ideas of state reform originate and when did they arrive in Spain? Finally, did the Bourbon Reforms succeed either in the peninsula or in the Americas? Leading voices in these debates include Herr, Paquette, and Sánchez-Blanco, with notable contributions from Barbara and Stanley Stein, Jeremy Adelman, D.A. Brading, Kenneth Andrien, and Allan Kuethe.[5]

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[3] Francisco Sánchez-Blanco, *La Mentalidad Ilustrada* (Madrid: Taurus, 1999). For other examples, see: Francisco Sánchez-Blanco, *El absolutismo y las Luces en el reinado de Carlos III* (Madrid: Marcial Pons, 2002); Olga Quiroz-Martínez, *La Introducción de la Filosofía Moderna en España: el Eclecticismo Español de los Siglos XVII y XVIII* (D.F., México: Colegio de México, 1949); José María López Piñero, *La introducción de la ciencia moderna en España* (Barcelona: Ediciones Ariel, 1969).

[4] Gabriel Paquette, *Enlightenment, Governance and Reform in Spain and Its Empire, 1759-1808* (New York: Palgrave Macmillan, 2008). Also see his edited collection for excellent essays in the new turn in Bourbon Spain historiography: Gabriel Paquette, ed., *Enlightened Reform in Southern Europe and its Atlantic Colonies, c. 1750-1830* (Burlington VT: Ashgate, 2009).

[5] For an analysis of the field which I agree wholeheartedly with, see: Gabriel Paquette, "Book Review: Empire, Enlightenment and Regalism: New Directions in Eighteenth-Century Spanish History," *European History Quarterly* 35, no. 1 (2005): 107–117; Allan J. Kuethe and Kenneth J. Andrien. *The Spanish Atlantic World in the Eighteenth Century: War and the Bourbon Reforms, 1713–1796* (New York: Cambridge University Press, 2014), 12-28; Gabriel Paquette, "The Dissolution of the Spanish Atlantic Monarchy," *The Historical Journal* 52, no. 01 (2009): 175–212. For these contributions, see: Stanley J. Stein and Barbara H. Stein, *Apogee of Empire: Spain and New Spain in the Age of Charles III, 1759-1789* (Baltimore: Johns Hopkins University Press, 2003); Stanley J. Stein and Barbara H. Stein, *Silver, Trade, and War: Spain and America in the Making of Early Modern Europe* (Baltimore: Johns Hopkins University Press, 2000); Jeremy Adelman, *Republic of Capital: Buenos Aires and the Legal Transformation of the Atlantic world* (Stanford, Calif: Stanford University Press, 1999); Jeremy Adelman, *Sovereignty and Revolution in the Iberian Atlantic* (Princeton: Princeton University Press, 2006); Jeremy Adelman, "An Age of Imperial Revolutions," *American Historical Review* 113, no. 2 (2008): 319–340; D. A. Brading, "Bourbon Spain and its American Empire," in *The Cambridge History of Latin America*, ed. Leslie Bethell,

As is clear from its historiography, the Caroline era, the flourishing of Spain during the reigns of Charles III (r: 1759-1788) and Charles IV (r. 1788-1808) in Spain, have been the subject of a great deal of scholarship.[6] In addition to the political and economic centralization these works describe, the scientific program of the Bourbon reformers has also received significant historical attention. Spain sent twenty scientific voyages to the Americas during the reign of Charles III alone.[7] However, historical studies of these scientific voyages have tended to limit their scope to certain "archetypical" voyages and/or heroic explorers. Thus, the bulk of the literature treats three voyages: the contributions of Jorge Juan and Antonio de Ulloa to the 1735 expedition to Perú to measure the global meridian, often referred to as the 'La Condamine Expedition;' the work of José Celestino Mutis, who directed the twenty-five year Royal Botanical Expedition to New Spain; and the voyages of Alejandro Malaspina, who led the most ambitious late eighteenth century Spanish scientific expedition and is remembered for his political as well as scientific endeavors.[8] This focus on the heroic explorer may also be found in the wider literature concerning eighteenth century voyages of discovery.

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vol. 1, 11 vols. (New York: Cambridge University Press, 1984), 398–439; Kuethe and Andrien. *The Spanish Atlantic World in the Eighteenth Century: War and the Bourbon Reforms, 1713–1796*.

[6] I adopt the periodization of "Caroline era," denoting the reigns of Charles III and Charles IV from 1759 to 1808, from the work of Gabriel Paquette and others. Another prominent label is that of the "Bourbon Reform" era. I prefer the first, denoting purely temporal periodization, whereas the latter seems refer only to political, economic, religious, and cultural changes.

[7] For a brief overview of the issues, see Manuel Lucena Salmoral, "Las expediciones científicas en la época de Carlos III (1759-1788)," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 49–63.

[8] For studies focusing on the "heroic" voyagers, see Juan Pimentel, *Viajeros Científicos: Tres Grandes Expediciones Al Nuevo Mundo: Jorge Juan, Mutis, Malaspina* (Madrid: Nivola, 2001); Iris Wilson Engstrand, *Spanish Scientists in the New World: The Eighteenth-Century Expeditions* (Seattle: University of Washington Press, 1981).

(Consider, for example, the legacy of Captain James Cook.)[9] In addition to studies of heroic explorers, there have also been studies reflecting on the entirety of late-eighteenth-century Spanish voyages as a collective enterprise.[10] For example, Daniela Bleichmar has expanded the scope of these studies by describing novel processes of botanical visualization and the construction of colonial identities that developed within these expeditions.[11] The present study – in contrast to much of the historiography about Spanish expeditions – seeks to consider both the peninsular and the colonial geographic projects as manifestations of a singular, larger and more comprehensive project. Previous studies of Spanish scientific voyaging have failed to adequately connect the scientific expedition phenomenon back to the government that supported these scientific endeavors and the objectives that governmental ministers had in sponsoring the voyages. Juan Pimentel Igea, for example, has carefully studied the political components of the Malaspina Expedition, but such analysis needs to be applied more widely to the entirety of eighteenth century Spanish geography.[12] One promising development has been the

[9] R. Iliffe, "Science and Voyages of Discovery," in *The Cambridge History of Science, vol. 4: Eighteenth-Century Science*, ed. Roy Porter (Cambridge [England]: Cambridge University Press, 2003), 618–45.

[10] Antonio Lafuente and Leoncio López-Ocón, "Scientific Traditions and Enlightenment Expeditions in Eighteenth-century Hispanic America," in *Science in Latin America: A History*, ed. Juan José Saldaña, trans. Bernabé Madrigal (Austin: University of Texas Press, 2006), 123–150; Salmoral, "Las expediciones científicas en la época de Carlos III (1759-1788)." Lafuente and López-Ocón wish to expand the field of Spanish scientific voyaging by looking at expeditions commissioned by ecclesiastic and viceregal authorities.

[11] Daniela Bleichmar, *Visible Empire. Colonial Botany and Visual Culture in the Eighteenth-Century Hispanic World,* (Chicago: University of Chicago Press, 2012); Bleichmar, "Painting as Exploration: Visualizing Nature in Eighteenth-Century Colonial Science." *Colonial Latin American Review* 15, no. 1 (June 1, 2006): 81–104; Bleichmar, "Exploration in Print: Books and Botanical Travel from Spain to the Americas in the Late Eighteenth Century." *Huntington Library Quarterly* 70, no. 1 (March 1, 2007): 129–151.

[12] Juan Pimentel Igea, *La física de la monarquía: ciencia y política en el pensamiento colonial de Alejandro Malaspina (1754-1810)* (Aranjuez: Doce Calles, 1998); Juan Pimentel Igea, "Imperio e Ideologia Colonial en Alejandro Malaspina," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 277–283.

work of Neil Safier describing the practices by which geographical and natural historical knowledge was transmitted from the field to the metropolis, but his work does not explain how this knowledge was employed by the government in the metropolis.[13] While historians of science have written on the phenomenon of scientific voyaging in Caroline Spain, treating it both collectively and focusing on individual efforts, paradoxically they have largely treated voyages as somewhat discrete events. My dissertation project combines these historiographical trends by analyzing how and why Bourbon monarchs and their ministers used geography to advance the agenda of state centralization and reform.

Although this dissertation will discuss eighteenth century Spain, I do not discuss at length the question of the 'Spanish Enlightenment.' The Spanish Enlightenment was a conservative, pragmatic appropriation of ideas from the larger European intellectual culture. It was characterized by anticlericalism, experiments in economic liberalism, modern science, and increasing social and intellectual value of historical analysis. All of these were to be utilized as powerful tools in the many interests of governance. In this dissertation project, however, I do not wish to engage the thorny historiographical category of 'The Enlightenment' or whether there was a Spanish version of it. Rather, I focus on the science of geography and its place in the reformist environment of Caroline Spain. Thus, I consider it essential to explain the introduction to Spain of some scientific ideas and methodologies that we have come to associate with the European Enlightenment and explore their relationship to geography.

[13] Neil Safier, *Measuring the New World: Enlightenment Science and South America* (Chicago: University of Chicago Press, 2008).

Geography and the State

This dissertation documents the introduction of a new geographic vision to a global empire of the eighteenth century. While "geographic" is, admittedly, a broad concept whose definition is historically contingent, this dissertation attempts to trace activities of observation, measurement, and mapping that fulfill the eighteenth-century conception of geography as a discipline.[14] As Numa Broc explains,

> In the 18th century geography meant above all cartography, and the French phrase *savoir la carte* (knowing the map) was a synonym for having a good grasp of geography. The essential function of the geographer, in the silence of his study, was to correct existing maps by using the most recent accounts of travelers. Maps and travelers' reports, then, were the twin foundations of the geography of the Enlightenment.[15]

In addition to maintaining an eighteenth-century conceptualization of geography as a discipline, this dissertation argues for the pervasiveness of a "geographic vision." Such language – or the more common "geographic imagination" – is currently used widely in historical writing, but scholars often invoke the term in contradictory ways. John Wright originated the concept of a "geographic imagination" in an address to the annual convention of the Association of American Geographers in 1947.[16] Wright's paper was a discussion of two different instances in which the use of imagination furthered the objectives of a geographer. In the first, Wright examines how knowledge of the existence of a certain unknown quantity compels the geographer's imagination to create a mental image of the unknown. As more information is discovered this mental image is refined accordingly, but Wright asserts that the introduction of new details also leads to the

[14] Throughout this dissertation I use the phrases "geographic science," "discipline of geography," or "geographic practice" in order to distinguish when I am speaking about the methodologies utilized to measure spaces and when I am referring to the landscape itself.

[15] Numa Broc, "Geography," in *Encyclopedia of the Enlightenment,* Michel Delon, ed., (Chicago, IL; London: Fitzroy Dearborn Publishers, 2001), vol. 1: 583.

[16] John Wright, "Terrae Incognitae: The Place of the Imagination in Geography," *Annals of the Association of American Geographers* 37, no. 1 (1947): 1–15.

creation of further imaginations.[17] In Wright's second instance, the geographer uses imagination to share conceptions of *terrae incognitae* with others. This action, he allows, is akin to that of producing a memory in the map-consumer of a geographic space that they have never seen.[18] From Wright's initial, playful essay the concept of "geographic imagination" has attained widespread usage among historians. The concept is used to substantiate arguments about tools of empire, secrecy, subterfuge, and identity construction. Developing in parallel, Arthur Robinson and Barbara Petchenik argued in the 1970s for the conceptualization of mapping as both a language and cognitive space.[19] Building on their work, J. Brian Harley wrote about the negative consequences of cartographic imaginations.[20] More recently, Doreen Massey has suggested that all geographic thinking inherently has both an imaginary and a sensory cognitive component.[21] Massey convincingly concludes that "it is probably now well accepted, though it is still important to argue, that a lot of our 'geography' is in the mind. That is to say we carry around with us mental images of the world, of the country in which we live (all those images of the North/South divide), of the street next door."[22] Stephen Daniels, in his introduction to a special volume of the *Transactions of the Institute of British Geographers* offers this succinct overview of the concept:

> As a concept, the geographical imagination varies in scope. It may denote specific techniques of knowledge, often forms of visual media and image-making, or

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[17] Ibid., 3.

[18] Ibid., 4. There is obvious overlap here with Steve Shapin's problematic concept of "virtual witnessing," see: Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, N.J.: Princeton University Press, 2011), 55, 225.

[19] Arthur Howard Robinson and Barbara Bartz Petchenik, *The Nature of Maps: essays toward understanding maps and mapping* (Chicago: University of Chicago Press, 1976).

[20] J. B. Harley, *The New Nature of Maps: Essays in the History of Cartography*, ed. Paul Laxton (Baltimore, MD: Johns Hopkins University Press, 2001).

[21] Doreen Massey, "The Geographical Mind," in *Secondary Geography Handbook*, ed. David Balderstone (Sheffield: Geographical Association, 2006), 46–51.

[22] Ibid., 48.

> overarching, theoretical modes of comprehension and experience. In this bigger picture imagination is a way of encompassing the condition of both the known world and the horizons of possible worlds, as when Frederic Jameson noted 'It seems easier for us to imagine the end of the world than the end of capitalism.'[23]

The importance to historical analysis of identifying the geographic imagination that informed the actions of our historical actors has been, perhaps, most clearly articulated by Matthew Edney in the introduction to his study of the triangulation survey of British India:

> They mapped the India that they perceived and that they governed. To the extent that many aspects of India's societies and cultures remained beyond British experience and to the extent that Indians resisted and negotiated with the British, India could never be entirely and perfectly known. The British deluded themselves that their science enabled them to know the 'real' India. But what they did map, what they did create, was a *British* India. Wrapped in a scientistic ideology, each survey and geographical investigation was thoroughly implicated in the ideology of the British empire in South Asia.[24]

Surely, the process of mapping did not alter the physical geography of India, but the process of mapping by British surveyors who came to India with a specific geographic imagination and then reformulated it while surveying the subcontinent defined both Britain and India. That is, for Edney the image of British imperialism was defined by the practice of surveying its colonial holding.

In this dissertation my discussion of geographic imagination attempts to remain grounded in Wright's original intent, while being heavily influenced by the work of Matthew Edney. I discuss how governmental agents attempted to use geographic knowledge, including cartographic products, to persuade foreign diplomats of the coherence of Spanish territoriality and also to unify Spaniards across the trans-

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[23] Stephen Daniels, "Geographical Imagination," *Transactions of the Institute of British Geographers* 36, no. 2 (2011): 183.

[24] Matthew H. Edney, *Mapping an Empire: the Geographical Construction of British India, 1765-1843* (Chicago: University of Chicago Press, 1997), 2-3.

hemispheric Spanish world by convincing them of a shared heritage grounded in their common linguistic, cultural, and religious identity. Additionally, I examine how various actors' imagined geographical visions of the Spanish world were used to guide reform, demand monarchial attention, and warn of imminent decline of the Spanish monarchy. To describe this process I have adopted the shorthand of "geographic reform," by which I mean those aspects of the larger state reform project in Bourbon Spain that were dependent upon and informed by the science of geography.

The literature concerning geography and the state is far too extensive to be summarized in this introductory essay.[25] Two works stand out, however, for their impact on the way I have approached archival sources. First, the work of Peter Sahlins is critical to my understanding of the vital role of geography in governmental policy. Sahlins examines the impact of border creation in the Pyrenees as a means of delineating national lines, constructing national identity, and altering the conception of sovereignty from jurisdiction to territoriality.[26] Sahlins shows that to study geography, a far more expansive discipline than simply cartography, we must include social and cultural processes of identity production.[27] Second, the work of Lauren Benton outlining the interactions between legal thought and geography in European colonialism has been vital

[25] I refer the reader to James Akerman's review: James Akerman, "Introduction," in *The Imperial Map: Cartography and the Mastery of Empire*, ed. James Akerman (Chicago: University of Chicago Press, 2009), 1–9. See also James Akerman and David Buissert, eds., *Monarchs, Ministers and Maps: The Emergence of Cartography as a Tool of Government in Early Modern Europe* (Chicago: University of Chicago Press, 1992).

[26] Peter Sahlins, *Boundaries: the making of France and Spain in the Pyrenees* (Berkeley: University of California Press, 1989). For more on the issue of delineating boundaries, see Edwin Danson, *Drawing the Line: How Mason and Dixon Surveyed the Most Famous Border in America* (New York: John Wiley, 2001).

[27] Benedict Anderson suggested as much, but his work is now both unconvincing and outdated. See: Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism*, Rev. ed. (New York: Verso, 2006), 170–178.

to my understanding of European state reform.[28] By considering legal anomalies developed to articulate sovereignty in irregular territorial spaces, Benton illuminates the tentative and fragile nature of European sovereignty as a nexus of enclaves and corridors. Focusing on areas of territorial contestation – as Benton has done – allows me to frame broader conclusions about the importance of geography for state reform in eighteenth-century Spain.

Recent developments in the history of cartography may be divided into two phases. The first, characterized by its champion John Brain Harley, was a turn towards the philosophical understanding of maps as documents embedded with social and political power.[29] Harley argues that maps needed to be "deconstructed," and that maps were objects of "silence and secrecy" which harbored "hidden agenda[s]."[30] Running parallel to this turn and in many ways opposite to it has been the continuation of an older view of maps as purely mathematical objects, bereft of political intent and theoretical interpretation. As Sonja Brentjes has so eloquently stated: "[t]hese mathematical elements of map making were all that mattered to earlier historical studies of maps. Everything else was decoration, at best pretty, in average superfluous, at worst distracting

[28] Lauren Benton, *A Search for Sovereignty: Law and Geography in European Empires, 1400—1900* (Cambridge: Cambridge University Press, 2010).

[29] For Harley's posthumous *magnum opus*, see J. B. Harley, *The New Nature of Maps: Essays in the History of Cartography*. The origins of this philosophical turn may be found in Robinson and Petchenik, *The Nature of Maps*. For an assessment of Harley's impact, see Denis Wood, "The Map as a Kind of Talk: Brian Harley and the Confabulation of the Inner and Outer Voice," *Visual Communication* 1, no. 2 (June 1, 2002): 139–161. For another theoretical reading of cartography see David Harvey, "Between Space and Time: reflections on the geographical imagination," *Annals of the Association of American Geographers* 80, no. 3 (1990): 418–432.

[30] J. B. Harley, "Deconstructing the Map," in *The New Nature of Maps: Essays in the History of Cartography*, ed by. Paul Laxton (Baltimore, MD: Johns Hopkins University Press, 2001), 149–168; J. B. Harley, "Silences and Secrecy: The Hidden Agenda of Cartography in Early Modern Europe," in *The New Nature of Maps*, 84–107.

from the truly essential."[31] In my opinion the most promising avenue for the history of cartography is to deliberately blend these traditions; maps should be viewed as mathematical objects firmly embedded with both explicit and implicit cultural significances. The ongoing *History of Cartography* project has provided both perspectives, partitioned into regionally and, more recently, chronologically focused volumes.[32]

As part of recent trends in historiography, scholars have examined, debated, and theorized the construction, reformation, retention, and dismantling of empires.[33] Central to these conversations has been the role of geographic knowledge, in general, and cartographic products, in particular, to the formation of state consciousness.[34] As described by Jeremy Black, monarchial systems across Europe struggled during the eighteenth century to retain their territorial sovereignty at home and in the colonial realm. This led, in part, to a rising importance of mathematical cartography and field observation as a means of substantiating sovereignty claims.[35] As described by Dale Miquelon, French and British ministers relied on maps when available and their

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[31] Sonja Brentjes, "The Representation of Iran in Western Maps from 1300 to 1840," *Archives internationales d'histoire des sciences.* 60, no. 165 (2010): 457.

[32] John Brian Harley and David Woodward, eds., *History of Cartography*, 6 vols. (Chicago: University of Chicago Press, 1987).

[33] For overviews, see Jane Burbank and Frederick Cooper, *Empires in World History: Power and the Politics of Difference* (Princeton University Press, 2011). For reform, see: Gabriel B. Paquette, *Enlightenment, Governance and Reform in Spain and Its Empire, 1759-1808*; Gabriel Paquette, ed., *Enlightened Reform in Southern Europe and its Atlantic Colonies, c. 1750-1830*; Paul W. Mapp, *The Elusive West and the Contest for Empire, 1713-1763* (Chapel Hill: University of North Carolina Press; Published for the Omohundro Institute of Early American History and Culture, 2011). For retention, see: Matthew H. Edney, *Mapping an Empire*. For dismantling, see: Jeremy Adelman, "An Age of Imperial Revolutions."

[34] See, e.g., John Pickles, "Mapping the geo-body: State, territory and nation," in *A History of Spaces: cartographic reason, mapping, and the geo-coded world*, (New York: Routledge, 2004), 107–123. Pickles argues that changes in mapping from 1400 to 1600 were tied to shifts in identity, property, and political economy.

[35] Jeremy Black, "Change in Ancien Regime International Relations: Diplomacy and Cartography, 1650-1800," *Diplomacy & Statecraft* 20, no. 1 (2009): 20.

geographical imaginations otherwise during their negotiations of the Arcadian territory at the Treaty of Utrecht.

> In the Utrecht negotiations, the French were forced to sort out their priorities in the half-familiar world beyond the Atlantic […] As understood at Utrecht, the empire was also abstract – a simulacrum constructed from dispatches, maps, and theory. Having none of the obduracy of a real world, it was especially amenable to colonist 'remapping' that seemed rational and realistic.[36]

In the early eighteenth century gathering accurate geographical observations took a very long time and a great deal of effort. The resulting lag in timely information led to confusion as governments validated the authority of a certain map, but lacked recent observations of their territorial holdings.

A common narrative within the history of geography has described the construction of "cartographic states" as a post-Napoleonic War phenomenon. A cartographic state is one whose territorial limits are defined by its mapped, linear boundaries. The authority of geographical coordinates supersedes the social and cultural definition of sovereignty in this type of cartographic state. Jordan Branch, who traces developments in cartography and statehood as parallel processes beginning with the Treaty of Westphalia and culminating with the end of the Napoleonic Wars, has recently repeated this narrative.[37] Yet, Branch's analysis flattens both cultural and temporal differences, removing agency from historical actors and ignoring the social/cultural aspects of state cartography. Instead of the definitive alteration of statehood forwarded by Branch and others, this dissertation describes what I term "cartographic sovereignty." By cartographic sovereignty, I mean the recognition of observationally based mapmaking as

[36] Dale Miquelon, "Envisioning the French Empire: Utrecht, 1711-1713," *French Historical Studies* 24, no. 4 (2001): 654.

[37] Jordan Branch, *The Cartographic State: Maps, Territory and the Origins of Sovereignty* (Cambridge: Cambridge University Press, 2014).

an evidentiary claim of territorial control. The empirical measurement that underlay mathematical cartography in the eighteenth century implied physical presence in the region, making material and historical claims of sovereignty less and less important. In cartographic sovereignty the map became both the claim of sovereignty and the evidence of the claim.

In addition to situating the geographical products and cartographic works that defined the cartographic state firmly within their social, political, and cultural context, my work also tries not to underestimate the contingent and at times messy ways states compiled geographic knowledge during the eighteenth century. My objective is to understand the role of the science of geography in Spain over the eighteenth century and identify some general trends. Specifically, this dissertation's principal contribution to the scholarship of the geographical sciences in Bourbon Spain has been to identify two traditions in Spanish geographic practice and trace their development and interaction over the course of a century. This analysis reveals that while Spanish geographic practice was adapted from British and French methods by means of purposeful emulation, it gained a unique character in Spain as ministers applied geographic methods to state reform. Secondly, this analysis has also connected the many geographic expeditions conducted by the Spanish navy during the eighteenth century in order to define these expeditions as part of a cohesive program aimed at observationally based cartography and operating within a specific cultural register.

The opening of the dissertation is framed around the negotiations of the Treaty of Utrecht (1715) and Spain's losses following the War of the Spanish Succession (1700-

1715). Following the death of Carlos II (r. 1661-1700) war erupted across Europe as three presumptive heirs to the Spanish throne contested Carlos' chosen successor, Philip of Anjou. The new government met the acute imperial crises that this war revealed with a reinvestment in military capabilities and a focus on generating practical scientific knowledge. As Philip V of Spain (r. 1700-24; 1724-46), the young monarch inaugurated the House of Bourbon in Spain and began a century long process of state reform aimed at reversing late-Habsburg decline. The reform projects considered in this first chapter sought to curb governmental inefficiency through state centralization, institutional reform, and economic liberalization. To aid in these reforms, ministers collected geographic data that could provide an accurate picture of the scale and resource distribution of the empire. Concurrently, the rising importance of cartographic products in international diplomacy led Spanish diplomats to echo calls for increased geographic knowledge of the global Spanish monarchy.

In the second part of my dissertation, which is divided into two chapters, I examine the reforms enacted by Zenón de Somodevilla, marqués de la Ensenada (1702-1781), at mid-century. These reforms included the application of statistical science to governance, the scientific education of officials abroad, and the attempted delimitation of a permanent boundary in the Amazon. Chapter Two examines the policies of state reform led by the marqués de la Ensenada, which sought to create a centralized and unified Spanish nation. This was a goal that Ensenada believed could be achieved, in part, through reliance on science and technology, with cartographic images promoting the vision of a more politically unified Spain and civil engineering projects, such as canalization and roadwork, uniting Spanish industries. I argue that Ensenada propelled

Bourbon Spain towards an idealistic, utopian vision of a scientific state. Chapter Three focuses on the evolution of Spanish geographic knowledge by focusing on one region of this global monarchy, the Ibero-American boundary in the Amazon. Following the Treaty of Madrid (1750), boundary demarcation surveys were conducted jointly by Spain and Portugal through the end of the eighteenth century. The narratives that resulted from these efforts and the changing attitudes of Bourbon ministers towards cartographic knowledge illustrate the role of geography in the diplomatic and governmental realm during this period.

The third part of the dissertation, consisting of three chapters, examines reform and Spanish geography during the reigns of Charles III and Charles IV (1759-1808). Chapter Four showcases visual representations of the Spanish empire as state projects overseen by the Royal Academy of History and the navy. While the former institution utilized an alternative geographic methodology based in historicism and the compilation of previous maps, the latter institution adopted a scientific methodology dependent on observation in the field. Government ministers entrusted these two institutions to undertake an ambitious mapping effort that would result in up-to-date encyclopedic atlases that would inform the reformist project. These respective attempts to create such atlases bring into focus the tensions that prevailed in the broader panorama of science during the Bourbon Reform era between innovation and constancy, empiricism and historicism, and, finally, between geography defined through observation in the field and geography distilled from archival sources. Chapter Five examines the impact of geographic projects on the broader Bourbon Reform movement, specifically developments related to state centralization, the defense of imperial peripheries, and the

growth of the imperial economy. These reforms led to the widespread adaptation of a 'spirit of quantification' within the state bureaucracy and congealed into a unique and definable Spanish geographic practice, characterized by three essential components: pragmatic methodology, observational redundancy, and a focus on peripheral regions. Chapter Six examines visual representations of the Spanish empire by individuals working outside of the governmental projects petitioning the state's central body for attention. Using two case studies, the allegorical map of Vicente Memije and the analytical map of Juan Antonio González Cañaveras, this chapter traces how Spaniards attempted to use cartographic imagery and the conception of a singular, unified monarchy to petition the central state organ for increased intervention in colonial affairs. Memije produced his map in the Philippines, aiming to increase monarchial investment in that colony. While working in Madrid, Cañaveras created a map that functioned as a tool for rational governance of the global monarchy.

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I have modernized spellings and phrasings of the original Spanish texts, except in cases where the original language is indicative of some cultural or intellectual quality of its author. (Unless otherwise noted all translations and translational errors are mine.) Brief biographies of select figures may be found in an appendix for the reader's convenience.

Part I
Chapter One
Charting a Path of Reform

In 1711, Philip V, King of Spain (r. 1700-'24; 1724-1746), exhausted by prolonged and costly conflict in Europe and across the Atlantic, sought an end to the War of the Spanish Succession (1700-1714). A prolonged affair, the conflict nominally decided the successor to Carlos II (r. 1665-1700) to the Spanish throne.[1] In reality, however, the war – which ensnarled all of Europe – was fought over political ideologies, commercial rights, and imperial futures. Under the peace negotiated as the Treaty of Utrecht (1713), Spain lost territories in Europe – including its possessions of Gibraltar, the Spanish Netherlands, and Naples – but retained most of its possessions in the Americas. In addition to the transfer of territory, Spain was forced to grant Great Britain exclusive right to the slave trade for thirty years (the *asiento*). The effects of Utrecht were varied and, sometimes, unintended. For example, the conclusion of naval conflict and loosening of trading restrictions across the Atlantic after 1715 drove many former seamen and privateers to piracy. This only enlarged an already abundant fleet of pirates plaguing the Caribbean and West African coastline during the early eighteenth century, all of which further contributed to Spain's economic hardships. This chapter will trace another unintended effect of the negotiations in Utrecht: the introduction of principles of diplomatic cartography to Spanish governance and the reorganization of geographic science in Spain.

It was out of consideration for his "faithful vassals" that Philip V concluded that Spain had neither the military nor financial resources required to continue the war in

[1] To avoid confusion with the contemporaneous Charles II of England, I will refer to Carlos II of Spain using his Spanish first name. I anglicize all other royal names for the reader's ease.

1711. Additionally, while Louis XIV of France, Philip's grandfather, had spent considerable resources to install a member of the House of Bourbon on the Spanish throne, France could no longer afford the prolonged conflict, either. Facing powerful European rivals and dissent in parts of the composite Spanish monarchy, Philip sought a period of peace to rebuild Spain. In a letter to the powerful Duke of Osuna, Philip explained that:

> The King, my grandfather, has made me understand the need to leave this war owing to the exhaustion it has caused his finances, because of so many misfortunes that have occurred in the course of it. I have also considered the bad state my [own] royal finances and my faithful vassals have suffered until now, that I was not in a state to support this cruel war in my kingdoms of Spain and [judged that] it was more virtuous to grant some advantages to England in Spain than expose it another time, or expose my kingdoms, by the continuation of the war with the same cruel conditions.[2]

Philip and Louis had succeeded in securing the Spanish throne, but concessions to their rivals would be required in order to solidify the claim. Moreover, Philip sat in an awkward throne. He reigned as King of Spain, but was unable to defend that throne without Louis' assistance. Having secured his royal title, Philip began to establish his authority over the Spanish monarchy and its vassals who often thought of themselves principally in reference to their local identity (*patria natural*) and only tangentially to Spain as a state (*patria nacional*). While Castile supported the Bourbon claim, Philip V had faced opposition in parts of the kingdoms of Aragon and Valencia fueled by

[2] Philip V to Duke of Osuna, 25 January 1712, Archivo Histórico Nacional (AHN), Estado, leg. 3376(1) exp. 11 as quoted in Joaquím Albareda i Salvadó, "Felipe y la negociación de los Tratados de Utrecht: bajo los dictados del 'mejor abuelo del mundo'," *Cuadernos de Historia Moderna* (October 29, 2013): 49. "*El rey mi abuelo me a hecho comprehender la nezesidad que había de salir de esta guerra por lo exausto que se hallavan sus finanzas, a causa de tantos malos suzesos como havían sobrevenido en el curso de ella. He considerado también el mal estado de mi real hacienda y lo que mis fieles vasallos an padezido hasta aora, que no estava en estado de sostener esta cruel guerra en mis reynos de España y que más valía otorgar algunas ventajas a ingleses en España que exponer otra vez, ni exponer a mis reynos, con la continuación de la guerra a los mismos crueles accidents*"

Francophobia and regional politics. His attention to his "faithful vassals" now required uniting them by somehow convincing all Spaniards of his legitimacy as their monarch.

Beginning with Philip V, the Spanish Bourbons ushered in a period of profound reform in Spain. These reforms were characterized by a process of state centralization, economic liberalization, institutional reform, and a renewed investment in science by the Spanish Monarchy. Underpinning each element of this reform was a new geographic sensibility. Geographic knowledge was needed to defend Spanish borders, expose mercantile inefficiency, unify the empire, and resurrect Spain as the global power of its Golden Age. Insomuch as the Spanish state required reform, its reforms would necessitate investment in geographic science.

While Utrecht ended the conflict, the war had exposed Spanish vulnerabilities in Europe and across its trans-hemispheric empire at the dawn of the eighteenth century. These vulnerabilities were partly caused by Spain's lack of accurate geographic data describing its global monarchy. The negotiations at Utrecht further demonstrated that the central institutions of the Spanish government lacked critical data on colonial populations, fortifications, and territorial boundaries. Furthermore, what little information the Spanish empire collected focused on urban centers, not its vulnerable peripheries. Lastly, information was stored in regional and ministerial organs that obscured the grand picture of an empire at a crossroads. To save the empire and prepare for future conflict vast reform was needed within Spain and an essential component of this reform would be the purposeful and informed collection of geographical material.

This chapter describes the reinvestment in Spanish geographic science by Philip V as part of his larger project of state reform. The chapter begins by briefly recapitulating

the War of the Spanish Succession and the subsequent concord negotiated at Utrecht, paying particular attention to the consultation of commercial maps as part of the transfer of territories between combatants. As part of this summary, the chapter briefly examines cartographic projects in Britain and France, whose ministers introduced the practice of diplomatic cartography to Spanish ministers during their negotiations at Utrecht. Reformers soon sought to introduce elements of the British and French geographic practices to Bourbon Spain. The chapter then returns to Spanish reform and its reliance on geographic science by summarizing Spanish geographic preeminence in the fifteenth and sixteenth centuries before reflecting on the manner in which Spanish geography stalled during the seventeenth century. Finally, the chapter describes Spanish Bourbon investment in military academies and civil geographic institutions, as well as Spanish participation in global scientific expeditions during Philip's reign. The chapter concludes that the acute crisis in Spanish geography and monarchial administration exposed at Utrecht motivated this subsequent investment in the science of geography and projects of state reform by Spanish authorities.

The War of the Spanish Succession and the Treaty of Utrecht

Monarchial instability spread across Europe in the mid-seventeenth century, but such crises were felt especially keenly in seventeenth century Spain.[3] Following the robust reigns of Charles V (r. 1516-1556) and Philip II (r. 1556-1598), characterized by audacious imperial expansion and strong monarchical presence in governance, the reigns of Philip III (r. 1598-1621) and Philip IV (r. 1621-1665) ushered in an era of weak

[3] John Elliott, "Revolution and Continuity in Early Modern Europe," in *Spain and Its World, 1500-1700: Selected Essays* (New Haven: Yale University Press, 1989), 92–113.

monarchs, if not weakened monarchy.[4] A notable aspect of this monarchial weakening was the increasing delegation of power to royal favorites by Philip III and Philip IV. Philip IV's favorite, the Count-Duke Olivares, was a central figure of this especially beguiling period of Spanish history.[5] Still, no Habsburg monarch of the seventeenth century was quite as ineffective as Carlos II of Spain (r. 1665-1700). As John H. Elliott so succinctly put it: "[t]he Castile bequeathed by Philip IV to his four-year old son was a nation awaiting a saviour."[6] Infirm in body and mind, Carlos II was unable to rule Spain himself for any meaningful length of time and, most problematically of all, he died without producing an heir.[7] These were the conditions that precipitated international conflict in the form of the War of the Spanish Succession (1701-1714).[8]

Despite his largely lackadaisical reign, Carlos II and his advisers were keenly aware of the trouble his death would create for the Spanish monarchy. In the summer of 1700 they prepared for Carlos' imminent death, choosing a successor from the three patrilineal candidates: Philip, Duke of Anjou, Archduke Charles, second son of the Holy Roman Emperor, and Prince Joseph Ferdinand of Bavaria. The fate of the Spanish monarchy, expansive both in Europe and across the Atlantic, was hardly a trivial matter,

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[4] The overarching narrative of these respective reigns is covered, albeit in a somewhat dated manner, by John Elliott, *Imperial Spain, 1469-1716* (New York: St. Martin's Press, 1964), 295–303; 316–354.

[5] For an analysis of the Count-Duke and his influence, see: John H. Elliott, *The Count-Duke of Olivares: The Statesman in an Age of Decline*. (New Haven: Yale University Press, 1990).

[6] Elliott, *Imperial Spain*, 356.

[7] Will and Ariel Durant penned perhaps the most brutal and pithy biography of Carlos II. "Short, lame, epileptic, senile, and completely bald before thirty-five, he was always on the verge of death, but repeatedly baffled Christendom by continuing to live." Will Durant and Ariel Durant, *The Age of Louis XIV: A History of European Civilization in the Period of Pascal, Molière, Cromwell, Milton, Peter the Great, Newton, and Spinoza: 1648-1715* (New York: Simon and Schuster, 1963), 452.

[8] For an overview of these issues, see John Lynch, *Bourbon Spain, 1700-1808* (Oxford, UK: B. Blackwell, 1989), 22–37; Antonio Ramón Peña Izquierdo-Portocarrero, *De Austrias a Borbones: España Entre Los Siglos XVII Y XVIII* (Astorga, León: Akrón, 2008); John M Merriman, *A History of Modern Europe: from the Renaissance to the present*, 2nd ed. (New York: W.W. Norton & Co., 2004), 302–306. While conflict originated in Europe it quickly crossed the Atlantic culminating in Queen Anne's War, among other conflicts.

however, and the opportunity to diminish Spanish territoriality agitated European politics. All of the possible successors possessed legitimate claims to the throne through the daughters of Philip IV, but it was Philip of Anjou whom Carlos II named to succeed him. The specter of a member of the House of Bourbon ascending to the Spanish throne was frightful for geopolitics and global commerce, uniting the considerable global power of France and Spain.[9] To defend their economic and military interests, the rest of Europe quickly moved to oppose Carlos' selection. William III, representing England and the independent Low Countries, demanded that Spanish territories be partitioned equitably between the three patrilineal candidates. Louis XIV, Philip of Anjou's grandfather and King of France, preferred his grandson be allowed to rule the entire Spanish empire. Finally, Archduke Charles and the Holy Roman Empire – vestiges of the Habsburg line – sought control of Spanish possessions in Italy. The ensuing war lasted thirteen years, outlasting many of the men who first instigated armed conflict, but, from 1700 on, Philip of Anjou enjoyed the title of Philip V of Spain.

The War concluded with the signing of the Treaty of Utrecht (1713), by which time Philip had already begun reforms of Spanish society and administrative governance. As a condition of the peace, however, Philip was forced to renounce his claim to the French throne and make a number of territorial concessions. Adding to tensions, Philip did not dictate Spain's interest at Utrecht himself. Rather, it was Louis XIV, Philip's grandfather, and his French ministers who negotiated on behalf of the new King.[10] The

[9] When, in 1712, the French royal family was struck by smallpox before Philip had renounced his claims to the French throne, fears of a goliath Bourbon empire came dangerously close to fruition. Merriman, *A History of Modern Europe*, 303.

[10] For recent analyses of Louis and his French ministers contributions to the negotiations at Utrecht, see: José Manuel de Bernardo Ares, "Los embajadores franceses en España: Primeros ministros de la Monarquía hispánica (170-1709)," in *La proyección de la monarquía hispánica en Europa: política, guerra y diplomacia entre los siglos XVI y XVIII*, ed by. Rosario Porres Marijuán and Iñaki Reguera

sense of shame this inspired in Spanish ministers – who were prevented from negotiating their own diplomatic matters – led some of those same ministers to propose reforms, ensuring that in future diplomacy the next generation of Spaniards would be able to engage their European counterparts as equals.[11] The general aim of these reforms was to centralize the Spanish governance as a means to curb administrative and economic inefficiency.

While the War of the Spanish Succession nominally contested Carlos II's successor, economic and political tensions between Great Britain, France, the Holy Roman Empire, and the Dutch Republic prolonged the conflict. These economic, political, and theological tensions were also apparent at the negotiations in Utrecht. In particular, French preeminence in Europe and across the Atlantic drove British involvement. The British sought to challenge rising French influence within the Atlantic trade, while Louis XIV noted that Atlantic trade was equally important to Philip's claim to the Spanish throne.[12] The Dutch Republic, for its part, feared that a unification of the Spanish and French thrones would return Antwerp to its former status as a commercial center, thereby challenging Amsterdam.[13] The Holy Roman Empire – as the House of

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(Bilbao: Universidad del País Vasco, Servicio editorial = Eukal Herriko Unibertsitatea, Argitalpen Zertbitzua, 2009), 121–145; Salvadó, "Felipe y la negociación de los Tratados de Utrecht."

[11] J. H. Elliott, "Learning from the Enemy: Early Modern Britain and Spain," in *Spain, Europe & the Wider World, 1500-1800* (New Haven: Yale University Press, 2009), 47. One notable response came from Gerónymo de Uztáriz, whose comparative economic treatise praised the mercantilist approach of France, England, and the Dutch Republic, see: Gerónimo de Uztáriz, *The Theory and Practice of Commerce and Maritime Affairs* (London: Printed for J. & J. Rivington, and J. Crofts, 1751). On the issue of Gibraltar, specifically, see: Archivo Historico Nacional (AHN), Estado Leg. 2848.

[12] "The main purpose of the present war is the Indies trade and the wealth it produces." Louis XIV to Amelot, 18 Feb. 1709, as quoted in Arthur McCandless Wilson, *French Foreign Policy During the Administration of Cardinal Fleury, 1726-1743: a study in diplomacy and commercial development* (Cambridge: Harvard University Press, 1936), 42. **"***Le principal objet de la guerre présente est celui du commerce des Indies et des richesses qu'elles produisent.*"

[13] Merriman, *A History of Modern Europe*, 303.

Hapsburg – sought to retain territorial holdings that had been part of the grand Habsburg-Spanish European monarchy that ended with Carlos' death.

In addition to European concerns, war had also exposed Spanish vulnerability throughout its trans-hemispheric empire. Administrative inefficiency, monarchial instability (not least of which the question of Catalan independence), and anachronistic juridical notions of sovereignty were among the diplomatic vulnerabilities Spain faced in Utrecht. The confederation of historical kingdoms that composed the Spanish Monarchy and were united *de jure* under Philip V, but the politically centralized government lacked a clear image of its composite pieces. From Madrid Philip and his French ministers could not easily determine the territorial boundaries, agricultural yield, or regional population density of the Spanish state. Regional authorities held much of this information, if it had been collected at all. The deterioration of the science of geography in Spain had left Philip V and his ministers without vital tools of effective governance of a centralized state. It had been the experience of negotiating with British and French agents at Utrecht that first exposed these deficiencies to Spanish ministers.

It is also noteworthy that the Treaty of Utrecht was not a singular peace, but, rather, a series of independent treaties negotiated between the many combatants.[14] The peace process was a prolonged affair.[15] France and Great Britain began their own negotiations in 1707, but it wasn't until 1713 that all factions abandoned their military

[14] For a comprehensive overview of the Treaty of Utrecht, see: Andreas Osiander, *The States System of Europe, 1640-1990: peacemaking and the conditions of international stability* (New York: Clarendon Press, 1994), 90–165.

[15] The prolonged process of negotiation led to a small economic boom for the city of Utrecht. Financial gain was spread across many different professions, including real estate, banking, and prostitution. For an account of the social conditions of the Congress of Utrecht – including the prostitution that catered to ministers of the various negotiating powers – see: "Hoge pruiken, plat vermaak." [Museum Exhibit.] Het Utrechts Archief, Hamburgerstraat 28, Utrecht. March 16 to November 25, 2013. I thank Professor Richard Kagan for bringing the issue of prostitution during the Congress of Utrecht to my attention.

campaigns. In fact, France remained in conflict with the Holy Roman Empire until 1714, long after they had each settled their conflicts with all other belligerents. One factor that delayed the peace process was the constant lag in communication between ministers – who were nominally plenipotentiaries – and the royal courts that, in truth, retained absolute authority. Each provisional agreement was followed by weeks of delay, as final approval was sought and minor adjustments were, inevitably, desired. Perhaps one of the most interesting and novel aspects of the negotiations at Utrecht was the use of printed maps by the British and French plenipotentiaries. That these two countries, each at the forefront of geographic knowledge, utilized print maps – which were enjoying a new level of commercial availability – as part of the diplomatic process is not entirely surprising. While conventional narratives regarding geographic knowledge and diplomacy have focused on the Treaty of Westphalia (1648)[16] as a key shift in cartographic diplomacy, meaning the acceptance of maps as evidence of territorial sovereignty, I contend that the use of maps at Utrecht has proven far more influential in the history Spanish governance and geographic science.[17]

At the Congress of Utrecht, British and French cartographic diplomacy focused mainly on the partitioning of Arcadian territory in the Northeastern Atlantic. Each aspect of this episode – Great Britain's experience using maps in diplomacy, France's engagement of new methods of mathematical cartography, and the emerging commercial map trade – is individually interesting, but it is their confluence and the importance that

[16] This peace ended conflict within the Holy Roman Empire and is recognized for establishing the concept of a sovereign state. Additionally, the diplomatic congress in Westphalia originated the principle of non-interference in the internal affairs of a sovereign state.

[17] For the more traditional narrative regarding cartographic diplomacy, see: Jordan Branch, *The Cartographic State: maps, territory and the origins of sovereignty*, 2014. As J.H. Elliott notes, Westphalia was not as influential in Spanish affairs of any kind when compared to other European powers: J. H. Elliott, "Europe after the Peace of Westphalia," in *Spain, Europe & the Wider World, 1500-1800* (New Haven: Yale University Press, 2009), 92–106.

cartography had in defining eighteenth century concepts of nationhood that drives the present argument. The survey of British and French cartography that follows illustrates the relative state of geographic science across Europe in the early eighteenth century. The second half of this chapter will juxtapose British and French geographic practice with early eighteenth century Spanish geographic science, as well as describe preliminary efforts by Philip V and his ministers to promote the discipline.

The Cassini Map of France

French geography underwent rapid development in the fifty years preceding Utrecht, beginning in 1661 when Louis XIV (r: 1638-1715) granted Jean-Baptiste Colbert broad authority over state matters.[18] At mid-century, France was at a crossroads. War with neighboring Spain had depleted the royal coffers, while domestic insurgence left France economically stagnant and lacking cohesive authority over its diverse provinces.[19] Using his newly acquired authority, Colbert first sought an accurate vision of the state of France upon which to base his reforms. He soon found, however, that

> he had no maps that could help him with two investigations he deemed of paramount importance: the visualization of the complex and overlapping administrative divisions of France (that were in dire need of simplification), and a thorough and accurate assessment of the kingdom's income, necessary for economic and tax reforms.[20]

Believing that scientific knowledge about the lands and conditions of the French provinces was essential to the reform process, Colbert recommended to Louis XIV that

[18] For more on Louis XIV and Colbert, see: John B. Wolf, *Louis XIV* (New York: Norton, 1968), 133–161.

[19] It is important to remember that France was not a singular, unified, territorially discrete entity. For more on the geographic evolution of France from composite monarchy' to discrete nation, see: Peter Sahlins, *Boundaries: the making of France and Spain in the Pyrenees* (Berkeley: University of California Press, 1989), 7–9.

[20] Monique Pelletier, "Cartography and Power in France During the Seventeenth and Eighteenth Centuries," *Cartographica* 35, no. 3/4 (Autumn and Winter 1998): 44.

France invest in promoting the 'practical arts.'[21] This investment included the founding of the *Académie Royale des Sciences* in 1666, notable for its royal patronage and status as an organ of the government (unlike its British counterpart). Additionally, Colbert secured approval for an astronomical observatory in 1667; its construction was completed in 1671. Early efforts of the Paris Observatory included systematic observation of Jupiter's satellites and the setting of the Paris meridian, two projects that influenced the development of geography in eighteenth century Europe.[22] These early efforts at the Paris Observatory were part of an ongoing process of determining accurate methods of calculating longitudes during the seventeenth century. The detailed charts of the Jovian moons were also central to another of Colbert's recommendations: a national territorial survey of France, an effort that is chiefly associated with the Cassini family.[23]

The Cassini Map of France, as the resultant map is called, was the product of the work of four generations of Cassinis' and took over fifty years to complete. Countless sketches produced and refined throughout the survey process informed this singular cartographic vision of France. The Cassini national survey – based upon direct observation and geodetic triangulation – was a radical and innovative advancement in geographic science of the era. This type of mathematical cartography was not new, per se. However, the prohibitive cost of surveys for gathering empirical data on a national scale had prevented widespread application of mathematical cartography to governance.

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[21] Colbert's devotion to natural philosophy has been documented in the history of the *Académie Royale des Sciences*, one product of his reforms. For more on Colbert and the Academy, see: Roger Hahn, *The Anatomy of a Scientific Institution: the Paris Academy of Sciences, 1666-1803* (Berkeley: University of California Press, 1971).

[22] Jean-Pierre Martin, *Une histoire de la méridienne: textes, enjeux, débats et passions autour du méridien de Paris, 1666-1827* (Cherbourg: Isoète, 2000), 14–16. Martin focuses especially on the impact of the Jean Picard on the early history of the observatory.

[23] For more on the national survey, see: Josef W. Konvitz, *Cartography in France, 1660-1848: science, engineering, and statecraft* (Chicago: University of Chicago Press, 1987), 1–31; Branch, *The Cartographic State*, 157–159.

With royal patronage – secured by Colbert through his broad authority – the first European national triangulation survey became possible. It is important to note that the national map survey, in part, challenged notions of historical boundaries in France by basing borders not upon old maps or textual descriptions, but upon recently collected astronomic data.[24] The story, perhaps apocryphal, of Louis XIV proclaiming that he lost more land to science than he had in any war is demonstrative of the rapid and surprising advancements that astronomy brought to geographic science at the time.[25] Quantifiable data allowed geographic boundaries to become tangible and discrete lines on the land, instead of remaining zones of influence nebulously determined by historical memory. The territorial limits of sovereignty were shifting from culturally defined reciprocal agreements between sovereign and subject which could be described in written texts or performed by the appearance of a peripatetic royal court, to graphic depictions of astronomically determined markers on a map that brought with them precision (or the appearance thereof) and conveyed a novel sense of rigidity to territorial boundaries. The discrete boundary line on the map concealed military and cultural power that informed its graphically simplistic representation of the division of territory. As Brian Harley has shown, maps may conceal both political and cultural power.[26] It is important to remember, however, that while maps might be instruments to advance hidden agendas,

[24] Pelletier, "Cartography and Power in France During the Seventeenth and Eighteenth Centuries," 42–47.

[25] For versions of Louis' claim, see: Rachel Hewitt, *Map of a Nation: a Biography of the Ordnance Survey* (London: Granta Books, 2011), 66; Branch, *The Cartographic State*, 1.

[26] For more on the power and hidden agendas of maps, see J. B. Harley, "Silences and Secrecy: The Hidden Agenda of Cartography in Early Modern Europe," in *The New Nature of Maps: Essays in the History of Cartography*, ed by. Paul Laxton (Baltimore, MD: Johns Hopkins University Press, 2001), 84–107; J. B. Harley, "Maps, Knowledge, Power," in *The New Nature of Maps: Essays in the History of Cartography*, ed by. Paul Laxton (Baltimore, MD: Johns Hopkins University Press, 2001), 51–82.

the advancement of cartographic technology also illuminated previously unknown realities.

The Down Survey

Great Britain similarly developed new geographic approaches in the half-century preceding Utrecht. The experience of settling land disputes in Ireland following the Cromwellian Conquest of 1652 – a cadastral surveying effort referred to as the Down Survey – informed British ministers negotiating territorial exchange at Utrecht. The Down Survey is illustrative of the seventeenth century competition between traditional methods of land management and the use of mathematical cartography by a central authority.

Following the Cromwellian conquest of Ireland, the Crown awarded confiscated lands to soldiers in lieu of proper payment.[27] Before lands could be distributed, however, England required a detailed survey of the conquered lands. Benjamin Worsley was appointed surveyor general in 1652, but he made slow progress and the little he did produce was soon deemed unacceptable or inaccurate. Following his vocal criticism of Worsley and his survey, William Petty, a physician serving the English military, was appointed to conduct a proper survey, giving specific attention to the confiscated lands. Petty's resultant work was called the Down Survey because he admeasured all the conquered estates down, apportioning lands as payment to the English soldiers.

[27] The Down Survey has received scant attention, but the classic account remains: Séan Ó Domhnaill, "The Maps of the Down Survey," *Irish Historical Record* 3, no. 12 (43 1942): 381–92. More recently, a project at Trinity College Dublin and the Irish Research Council has revived attention on the effort, see: Trinity College Dublin and the Irish Research Council. "The Down Survey Project." Last modified August 14, 2013 http://downsurvey.tcd.ie/index.html

The Down Survey was a cadastral survey of all the baronies in Ireland and was based on field observations, with the greatest detail given to the forfeited lands of the Cromwellian conquest. Much of the structure of the Down Survey was based upon another cadastral survey of Ireland, the Civil Survey, which had immediately preceded the Down Survey. The geographic methods that informed the two surveys were in stark contrast, however. The Civil Survey was a cadastral survey by inquisition, where agents visited each parish – which was the legal unit used to define the survey – and took a verbal deposition from each landowner as to the boundaries of their property. This older style of cadastral surveying produced only rough approximations of the size of each estate located in the parish and was at odds with the aims and methods of the mathematical cartography used in the Cassini survey, which relied on astronomical observation to define locations on the earth by geodetic coordinates of longitude and latitude and then relied on chain measurements to further define local tracts. This more precise, mathematical cartographical methodology was also utilized during the Down Survey. Field observations for the Down Survey were conducted from 1655 to 1657, although records were not compiled until 1659. The Down Survey employed unskilled soldiers to conduct initial observations. These agents were sent with simple instruments to observe natural features – such as hills, streams, meadows, and rock clusters – marking their location and defining characteristics in the logbook, before measuring the size of the properties by lengths of a provided chain. Particular features of the land were recorded, including its parish, townlands, proprietor, acreage, and whether the estate was profitable or unprofitable. The survey books containing this data were then sent to Dublin, where

skilled cartographers drew official maps including boundaries of the baronies and parishes, natural features, and prominent landmarks (such as churches and castles).

This survey effort, while part of the English conquest of Ireland, should not be considered in isolation. Jane Ohlmeyer has suggested that England 'tested' imperial policies during the conquest of Ireland that were deployed later in other English colonies.[28] Chief among these was the use of plantation, or the parceling of conquered lands into private ownership, as a means of placating the territory and creating new landed nobility. As Ohlmeyer quips "plantation became an instrument of royal policy and private enterprise was put to work for the purposes of the state."[29] Using the rhetoric of civility and the instrument of English Law, the state was able to reorient local populations under English cultural norms by reconfiguring the surrounding space, thus refashioning the land for English political and economic benefit. Further, the seizure of lands and redistribution of estates to settlers undermined historical claims of territoriality and the power of the older conquered state. Mathematical cartography and the partitioning of parishes into plantation tracts were used to erase local conceptions of space in Ireland and, elsewhere, to erase indigenous spaces and foreign claims of sovereignty. Following the success of the Down Survey in Ireland, England increasingly relied on precise surveys employing mathematical cartographic methodology to resolve territorial disputes and as part of English colonial expansion.

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[28] Jane H. Ohlmeyer, "A Laboratory for Empire?: Early Modern Ireland and English Imperialism," in *Ireland and the British Empire*, ed by. Kevin Kenny (New York: Oxford University Press, 2004), 26–60.

[29] Ibid., 38. English plantations have a long circ-Atlantic history. For the best overviews, see: Curtin, Philip D. *The Rise and Fall of the Plantation Complex: Essays in Atlantic History*. Cambridge, UK: Cambridge University Press, 1990; Berlin, Ira, and Philip D. Morgan, eds. *The Slaves' Economy: Independent Production by Slaves in the Americas*. London: Frank Cass, 1991.

Negotiating Acadia at Utrecht

As the preceding brief overview of the Cromwellian conquest of Ireland and the Colbertian project of state reform have shown, the use of more precise methods in geographic science could have a great impact on state matters. In fact, political reliance on geographic science only expanded in the wake of the War of the Spanish Succession. The use of geographic science – and mathematical cartography, in particular – in state matters was not a new development of this era. New to the seventeenth century, however, was a rapidly expanding commercial map trade. Advances in astronomical technologies along with the development of new printing techniques led to widespread consumption of cheaper, more accurate commercial maps.[30] Further, as astronomic markers established definitive and precise boundaries, governmental ministers shifted from considering maps as abstractions or visual aids to utilizing maps as authoritative legal evidence and a vision of reality. In the context of British diplomacy, Jeremy Black notes "the growing importance of maps ensured that their provision became an issue. Diplomats were expected to be active in this sphere. They procured maps both for other envoys and for the government in London. This was a reactive process."[31] This process was gradual, however. Especially given that in the early eighteenth century, not all European governments were prepared to adopt these principles and systematically collect maps. As the value of geographic science to enlightened governance became increasingly apparent, so too did the urgency for more precise cartographic representation of the governed

[30] For more on the conspicuous consumption of commercially available maps in eighteenth century Britain, see Geoff Armitage and Ashley Baynton-Williams, *The World at Their Fingertips: Eighteenth-century British Two-sheet Double-hemisphere World Maps* (Vaduz, Principality of Liechtenstein; London: Sylvia Ioannou Foundation; The British Library, 2012).

[31] Jeremy Black, *British Diplomats and Diplomacy, 1688-1800* (Exeter: University of Exeter Press, 2001), 121.

space.[32] At the end of the seventeenth century, the British Board of Trade held only a few maps; by comparison the French had amassed a sizable collection of surveys from across their empire. Following Utrecht, governments would begin to exchange maps more freely, both as an affirmation of their scientific prowess and as claims of their territorial sovereignty. Regardless, the ministers at Utrecht saw maps as convenient and accessible ways to divide vast territories or places of which they possessed no personal knowledge.[33]

As British and French ministers began negotiations, it quickly became apparent that both Bourbon crowns would need to concede territory to ease the multi-layered tensions that underpinned the conflict. Gibraltar, captured by the British in 1704, would be the key Spanish concession to Britain, while the French conceded territories in the Hudson Bay area. While the strategically important Gibraltar was easily defined, France's holdings in the northern Atlantic were perceived as a vast uncharted wilderness. Thus, redefining the line between British and French areas in the northeastern Atlantic required both governments to demonstrate how they conceptualized American geography.[34] Central to the discussions between the British and French were two issues:

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[32] J. H. Elliott, *Empires of the Atlantic World: Britain and Spain in America, 1492-1830* (New Haven: Yale University Press, 2006), 34.

[33] "In the Utrecht negotiations, the French were forced to sort out their priorities in the half-familiar world beyond the Atlantic […] As understood at Utrecht, the empire was also abstract – a simulacrum constructed from dispatches, maps, and theory. Having none of the obduracy of a real world, it was especially amenable to colonist 'remapping' that seemed rational and realistic." Dale Miquelon, "Envisioning the French Empire: Utrecht, 1711-1713," *French Historical Studies* 24, no. 4 (2001): 654.

[34] For the French perspective on these negotiations – which have greatly informed my own conceptualization – see: Miquelon, "Envisioning the French Empire." For other perspectives on the Hudson Bay territory in the negotiations at Utrecht, see: E. E. Rich, "The Hudson's Bay Company and the Treaty of Utrecht," *Cambridge Historical Journal* 11, no. 2 (January 1, 1954): 183–203; Dale Miquelon, "Ambiguous Concession: What Diplomatic Archives Reveal about Article 15 of the Treaty of Utrecht and France's North American Policy," *The William and Mary Quarterly* 67, no. 3 (July 2010): esp 472–477. For more on the economic importance of the region, see: Elliott, *Empires of the Atlantic World*, 111.

the balancing of historical claims and more easily defined natural boundaries, and the use of commercially available maps to set boundaries.

The British and French contestation of the Hudson Bay region was not a recent issue first raised at Utrecht. In fact, the two nations had contested territorial rights over the region for nearly a century. English claims were based upon the principle of *terra nullius,*[35] citing both their current occupation as well as a symbolic act of possession supposedly performed by Sebastian Cabot during his 1508-1509 voyage for King Henry VIII.[36] The French, citing the same legal principle, saw only the symbolic act of possession as necessary to secure the title of *terra nullius*, which they claimed had been performed by the French some thirty years before the confirmed arrival of Henry Hudson in 1609.[37] Maps, too, soon became part of the debate when English ministers protested that their act of possession predated the French and was labeled as such on available maps.[38] This debate continued in this manner from 1667 until 1699. In 1713, however, the growing grievances from the recent armed conflict allowed for the historical contentions to be set aside, at least temporarily.

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[35] "Terra nullius: land without an owner ("no man's land")*;* territory that may be acquired by a state's occupation of it" Bryan A. Garner, ed., *Black's Law Dictionary*, 9th ed. (St. Paul, MN: West, 2009), 1610. Under this legal definition, two things would be required to claim ownership: possession and symbolic acts.

[36] *Calendar of State Papers*, Colonial Series, America and West Indies, 1661-1668, 502-504; 422; 404; 412.

[37] *Calendar of State Papers*, Colonial Series, America and West Indies, 1685-1688, 388; 405. "Hudson may have sailed into the bay as many others did, but it is agreed that he took no possession, nor is there a trace of a settlement made by the English. Maps are of little importance. Those who make them try to push them by inserting novelties, without asking for any reasons. Several London maps say that the county all belonged to France before the English knew of them." June 1687. "There is no intention of proving rights of maps, yet the names given therein are convincing arguments as to the proprietorship. If the French intended to claim the country why were maps printed in Paris and dedicated to the Dauphin, with the English names therein?" July 1687.

[38] Oct. 4, 1667. *Calendar of State Papers*, Colonial Series, America and West Indies, 1661-1668, 503. "The King's title to Acadia, Canada, and countries adjacent is derived from the time that Sebastian Cabot took possession of that continent, and it is confessed in French maps that the gulf and river of Canada were first discovered by the English."

At Utrecht, the French interests were chiefly dictated by the proposals of Jérôme de Phélypeaux, comte de Pontchartrain. Pontchartrain's vision of the Americas was driven by mercantilist ideals and a desire for imperial simplicity.[39] In his mind, the only successful peace would be one that guaranteed "no divided jurisdictions, no international crazy-quilt pattern of colonial holdings."[40] In the Caribbean, this meant that holdings would be traded so that the British, Spanish, and French had clear and distinct zones of territoriality. Promoting an Enlightened colonial policy, Pontchartrain sought order and rationality in solving trade problems in the French Atlantic. In Acadia, however, Pontchartrain relied not on order and reason, but on historical claims and natural boundaries to partition the land. This policy produced a complicated lattice of interweaving zones of French and British influence, exactly the type of "quilt pattern" that Pontchartrain had opposed in the Caribbean. The French advocacy of a piecemeal solution in the Northeast belied the important defensive value of the Acadian woods and native populations for separating British and French colonial populations. This strategy proved only to delay the inevitable need for a detailed triangulation survey of the region for thirty years.[41]

In discussing the Acadian region, ministers were aided by the availability of commercially produced maps. In 1712 the French ministers sent a marked up British map to Louis XIV. The map had originally been annotated to show a British proposal for the Acadian boundary, but Louis' ministers drew additional lines on it to show the king

[39] For more on the administration of the French Empire at the time of Utrecht, see: Kenneth Banks, *Chasing Empire Across the Sea: communications and the state in the French Atlantic, 1713-1763* (Montreal: McGill-Queen's University Press, 2002), 43–64.

[40] Miquelon, "Envisioning the French Empire," 658.

[41] Mary Pedley, "Map Wars: the role of maps in the Nova Scotia/Acadia boundary disputes of 1750," *Imago Mundi* 50, no. 1 (1998): 96–104.

another possibility. It was their hope that by forcing the British north, away from the Saint Lawrence, France might preserve its monopoly on the fur trade in the "traitte de Tadoussac." Louis then responded to his ministers with further annotations of the map and a written note describing specific territorial goals to be discussed during the ongoing negotiation. Miquelon notes that maps were sent between the two courts, often annotated and re-annotated by various personalities. "As the map passed from hand to hand […] each man gazed at an image of America marked by scientific limitations and […] political ambitions."[42]

The use of commercially available maps presented as many problems as solutions, however. Although they are unnamed in the correspondence, the most likely candidates for the maps that were used were those printed by Herman Moll and John Senex.[43] These maps, like most maps of the time, were not entirely based on surveying. In fact, they were a mix of multiple accounts of travel through the region – ranging from the first European encounter with the land to the latest notices – treated with equal authority.[44] By treating all accounts equally, the cartographic image flattened two hundred years of European interaction with the landscape as well as the development of new observational technologies that had increased precision. Ministerial negotiation, then, was based upon a vision of America informed by multiple travelers' accounts that were not always in concert. While British and French ministers brought their own expectations to these

[42] Miquelon, "Envisioning the French Empire," 666.

[43] For more on Moll, see Matthew Restall, "Imperial Rivalries," in *Mapping Latin America*, ed by. Jordana Dym and Karl Offen (Chicago: The University of Chicago Press, 2011), 79–83; Dennis Reinhartz, *The Cartographer and the Literati: Herman Moll and his intellectual circle* (Lewiston, N.Y.: E. Mellen Press, 1997).

[44] "The intellectual problem these maps posed for negotiators was not simply one of accuracy or inaccuracy as they themselves might have thought, but of the difficulties of interpreting even the best cartographic abstractions without fantasy and of avoiding being lulled into complacency by apparent cartographic authority." Miquelon, "Envisioning the French Empire," 667.

commercial maps, it should not be forgotten that these maps likely also varied widely in their depictions. They had been drafted using different empirical evidence and distinctly different cartographic conventions. Using the commercially available maps as a guide, the plenipotentiaries attempted to focus their negotiations on identifying natural boundaries that could delineate distinct spheres of influence and act as unambiguous borders for the British and French. More importantly, they worked to create distinct fur-trapping lands. The inexactness of the maps complicated this process, however, showing different paths for the same river, or using variant toponyms to label a forest or mountain.

As cartographic sovereignty, that is, the recognition of maps as evidentiary claims of territorial sovereignty, advanced in Europe, the accompanying reliance on using natural boundaries to delimit spaces necessitated changes in geographical science. Many of these could be achieved through direct observation of the landscape, but subtler shifts had to occur as well in the way both map-makers and governmental agents perceived nature.[45] By tying political boundaries to natural features in territorial holdings, a sense of permanence was inherently ascribed to those elements of nature chosen to serve as boundary markers. Historical borders, derived from cultural practices and ministerial memory, achieved permanence from the performance of subjecthood, such as oaths of fidelity, which had to be reaffirmed periodically. Natural borders, in contrast, derived their legitimacy from their static condition within the environment. Such an understanding of nature held that sovereignty was proclaimed over a landscape that was permanent, even if its façade was subject to variation. This meant that flooding, drought, earthquake, canalization, or forest fire did not alter the status of boundaries that had been

[45] For a parallel observation on the application of rationality to nature, see: Clarance J. Glacken, *Traces on the Rhodian shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley: University of California Press, 1973), 693–697.

linked to the location of landmarks. This epistemology of nature relied on such landmarks, inherently holding that some natural features did not change.[46]

While the Cassini Map of France and the Down Survey had shown the political possibility of mapping, the division of Acadia at Utrecht was completed without similar reliance on direct observation or empirical surveying. It is unclear what prevented the ministers from demanding an extensive surveying project, but it is possible that since their treatment of Acadia was tied to commercial potentials and not military realities, the ministers felt no sense of urgency. Still, a condition of the treaty was that a bilateral boundary commission would be sent to survey the region; this condition was not met until political tensions escalated again, requiring a new treaty in 1750.

Spanish Geography at Utrecht

In contrast to the British and French negotiations described above, commercially available maps did not guide Spain's concessions at Utrecht. This was due in no small part to the lack of such charts for the Spanish regions under contestation. Charts of Spain had not been produced according to the principles of mathematical cartography recently, partially because foreign geographers had only been granted intermittent access to Spanish lands. We may be certain that it was this lack of cartographic evidence that precluded the use of commercial maps in the negotiations, since French ministers advocated the Spanish interests at Utrecht as well as those of France. Additionally, French and British ministers negotiating the European theater were as inclined to use maps as those settling the Atlantic claims. Jean Baptise Colbert, nephew of Louis' chief

[46] An even subtler condition of this conception of nature is the implication that a permanent nature might not be subject to divine whims.

minister and the marquess de Torcy, for example, referenced maps of the trans-Alpine region in a letter to Henry St. John, the viscount of Bolingbroke, his British counterpart.[47] Colbert de Torcy, as the younger Colbert was known, was the chief French diplomat at Utrecht. He argued for a more professionalized diplomatic corps in the court of Louis XIV, with map-usage apparently forming part of such professional conduct.

As Ricardo Padrón has argued, "the Spanish Bourbons inherited an official cartography of their overseas possessions that was obsolete even as it was going into print for the first time."[48] Exemplary of this was Antonio de Herrera's *Historia general de los hechos de los Castellanos en las Islas i Tierra Firme del Mar Océano* (1601), of which Andrés González de Barcia issued a new edition in 1730. To accompany the 1730 Herrera edition, maps made from plates of the manuscript maps of Juan López de Velasco – from the 1570s – were reused as well. There were scant other options for the Herrera edition in 1730, however, since Spanish state cartography had relied on manuscript maps throughout the sixteenth century and therefore plates for other maps did not exist. "So the Herrera maps, despite their poverty of detail and ornament, despite their questionable accuracy in many respects, continued by default to play their role as the officially sanctioned, public cartography of Spain's early modern overseas empire."[49] While Jordan Branch has argued that the formal language found in the treaties at Utrecht is demonstrative of differences in how territorial authority was framed in Europe versus

[47] Branch, *The Cartographic State*, 131.

[48] Ricardo Padrón, "From Abstraction to Allegory: the Imperial Cartography of Vicente Memije," in *Early American Cartographies*, ed by. Martin Brü ckner (Chapel Hill, NC: University of North Carolina Press; Omohundro Institute of Early American History & Culture, 2012), 41. For more on seventeenth century Spanish cartography, see Richard L. Kagan, "Arcana Imperii: Mapas, Sabiduría, y Poder a la corte de Felipe IV," in *El Atlas del Rey Planeta: la descripción de España y de las costas y puertos de sus reinos de Pedro Texeira (1634)*, ed by. Felipe Pereda and Fernando Marías (Hondarribia: Nerea, 2002), 49–70.

[49] Padrón, "From Abstraction to Allegory: the Imperial Cartography of Vicente Memije," 41.

the Atlantic, we must remember that it is no less demonstrative of the perception of cartographic authority by the governments of each nation. In the Spanish case, this difference is also indicative of Spain's temporary inability to produce cartographic images equaling those of its European rivals.

The lack of available cartographic images of Spanish territories led ministers to rely on older methodologies of defining sovereignty, the most notable aspect of their concessions at Utrecht. Instead of framing territorial concessions by using natural boundaries or referencing maps, Spanish and French ministers at Utrecht ceded Spanish territories as defined by depositions. In contrast, French and British ministers, while they stopped short of conducting a boundary commission in Acadia as part of their negotiation, still embraced mathematical cartography in their adjudication of territories. The lack of commercial maps of Spain was only compounded by the chaotic condition of Spanish institutional settings for compiling and creating geographic data of the trans-hemispheric monarchy during the latter seventeenth century, including mapping projects. The Spanish concessions at Utrecht were thus framed in the depositional language characteristic of the inquisitorial style of geography mentioned above as part of the Civil Survey of Ireland. Such language was characterized by listing historical boundaries and describing notable landmarks, and harkened back to a medieval legal and political geographic consciousness. While this geographic sensibility based upon deposition and historical memory ran parallel to mathematical cartography, the key observation here is that the availability of commercial maps allowed France and Great Britain to apply the latter in diplomatic matters and to do so earlier than Spain. The disposition of Gibraltar,

for example, as stated in Article X of the treaty between Philip V and Queen Anne offered an inexact description of the boundaries of the ceded area:

> The Catholick King does hereby, for himself, his Heirs and Successors, *yield to the Crown of Great Britain*, the full and intire Property of the Town and Castle of *Gibraltar*, together with the Port, Fortifications, and Forts thereunto belonging; and he gives up the said Property, to be held and enjoyed absolutely, with all manner of Right for ever, without any Exception or Impediment whatsoever.[50]

Such a description lacks the specificity or precision that astronomically determined coordinates brought to mathematical cartography. The castle and fortification of Gibraltar are not identified by their latitude or longitude, nor are the territorial limits of this enclave readily apparent to the reader. Rather, it is a historical memory of a certain place that is used to define the site in this legally binding transfer. This vague sense of territorial definition mirrors the geographic renderings of Gibraltar available at the time. Characteristic of the charts of Gibraltar available to ministers in 1714 was the *Mapa del puerto de Gibraltar, sitiada por el conde de las Torres* (1727), which depicts Gibraltar from a bird-eye perspective and contains a brief history of Spanish tenancy over the area beginning in 714 CE (see Figure 1.1).[51] Absent is the Cartesian grid of longitude and latitude or, at the very least, a compass rose to orient the viewer to the cardinal directions. Such an image conforms to cartographic conventions that are strikingly different than those that inform mathematical cartography. The *Mapa del puerto de Gibraltar* draws on early modern traditions of chorography, providing the viewer an image in relative space and without reference to its geographical location in the world.[52] This is in contrast to the

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[50] Fred L. Israel, ed., *Major Peace Treaties of Modern History, 1648-1967*, vol. 1 (New York: Chelsea House Publishers, 1967), 223.

[51] *Mapa del puerto de Gibraltar, sitiada por el conde de las Torres* [map], 1727. Archivo Histórico Nacional, Estado MPD.135.

[52] For more on the traditions of early modern chorography in the Spanish monarchy, see Richard Kagan, *Urban images of the Hispanic world, 1493-1793* (New Haven: Yale University Press, 2000), 11-12;

Figure 1.1 ***Mapa del puerto de Gibraltar, sitiada por el conde de las Torres*** **(1727), [AHN, Estado MPD.135]**

aims of mathematical cartography, where places are located within absolute space by means of longitudinal and latitudinal coordinates.

The lack of maps made the transfer of Gibraltar no less complicated than setting boundaries in the fur-rich Acadian territory. In fact, the same general issues of commercial rights and colonial safety complicated both territorial negotiations. While Great Britain sought Gibraltar as a door to Mediterranean commerce, Spain feared illicit

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Richard Kagan, "Community and Cartography in the Hispanic World," in *Visions of Community in the Pre-Modern World*, ed by. Nicholas Howe (Notre Dame: University of Notre Dame Press, 2002), 149–178.

trade with Andalusia would pass through the port.[53] This language was repeated in the cession of Minorca to Great Britain and of Sicily to the Duke of Savoy, in each case invoking vague historical memory of these places as their legal territorial definition.[54] This language was not limited to the final treaty, however, as the ministerial correspondence is littered with references to "the land close to his Majesty's heart" and "the land of the Queen's birth" in the place of proper toponyms or astronomically based boundaries.[55] Such imprecise territorial distinction was also present in the Pyrenees, where cultural and jurisdictional definitions obscured distinct Spanish and French sovereignties.[56]

As Jeremy Black has observed, our modern conception of coherent nations with discrete borders stands in contrast to:

> The patrimonies of ruling dynasties whose possessions and pretensions extended as a result of, and in the context of, feudal overlordships, rather than one of "natural" linear frontiers, such as rivers. This, however, was to be less the case in the second half of the eighteenth century, and the use of maps was related to this shift.[57]

This would also be the case in Spain, but only after the resurgence of Spanish geography as part of widespread reform of governance. The acute crisis in Spanish geography at Utrecht – that is, the lack of sound, modern geographic information across the Spanish empire – concerned matters beyond diplomacy. Spain also suffered economically from a

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[53] Israel, *Major Peace Treaties of Modern History, 1648-1967*, 1:224. The treaty also guaranteed that Jews and Moors would be kept from Spain, but that Catholic residents of Gibraltar would be free to practice their religion.

[54] Ibid., 1:224–225; 227–228. The transfer of Colonia de Sacramento back to Portuguese hands was similarly defined in historical, not mathematical, terms.

[55] Versailles, Marquis de la Cruz et de Barrechea 15 June 1730; Walpole to Barrechea, 15 June 1730. AHN, Estado 3386, Exp. 1. These phrases come during negotiation of the Treaty of Seville (1730), which renegotiated many of the territorial cessions in the Treaty of Utrecht, but are representative of ministerial language during both negotiations. As part of the treaty Great Britain retained Minorca, while Elisabeth Farnese, Queen of Spain, was granted her claim to the Duchy of Parma.

[56] Peter Sahlins has examined this issue of an in between zone, see: Sahlins, *Boundaries*.

[57] Jeremy Black, "Change in Ancien Regime International Relations: Diplomacy and Cartography, 1650-1800," *Diplomacy & Statecraft* 20, no. 1 (2009): 20.

lack of geographic information detailing both domestic and colonial agricultural production. Additionally, Spain lacked demographic information across the trans-hemispheric monarchy, something that proved to have political implications as well. This state of affairs was starkly at odds with Spanish geographic supremacy during its Golden Age.[58]

Spanish Geography: 1450-1715

To understand why Philip V and his ministers were surprised by the inability of Spanish geographic science to inform the negotiations of the Treaty of Utrecht, it will be necessary to provide the reader a general overview of geographic science in the early modern Spanish empire. Beginning in the mid-fifteenth century, the two Iberian monarchies enjoyed geographic preeminence among their European rivals. The influence of medieval Islamic science, particularly as related to astronomy and cartography, combined with the vibrant maritime tradition of the Mediterranean led Spain and Portugal to develop novel navigational and nautical charting techniques. With the incorporation of the Canary Islands in the 1470s, Spain began a two-century period of expansion and extra-territoriality unmatched in Europe. Spanish geography during the fifteenth and sixteenth centuries was characterized by rapid growth, which was quickly followed by the use of new technologies to administer and control new territories.

[58] The *Siglo del Oro* does not have precise dates, but for our purposes may be aligned with the period between the *Reconquista* (1492) and the beginning of Carlos II's reign (1665).

The Treaty of Tordesillas

The Treaty of Tordesillas, signed in 1494, confirmed the imperial and geographic supremacy of the Iberian nations.[59] The 'Papal Line of Demarcation' divided the world between João II of Portugal (r: 1481-1495) and the Catholic Monarchs, Ferdinand II of Aragon (r. 1479-1516) and Isabella I of Castile (r. 1474-1504), at a meridian 370 leagues west of the Cape Verde Islands, roughly halfway between the Portugal's easternmost possession and Columbus' newly discovered islands in the Indies.[60] The Treaty of Tordesillas granted the Iberian crowns the exclusive right to colonize territories not already possessed by a Christian ruler on either side of the line. Spain was granted all lands west of the line, while Portugal gained rights to undiscovered lands east of the line. This solution posed as many problems as it solved: by setting an arbitrary longitudinal line west of the Canaries, the treaty exposed the limitations of geographic epistemology in the late fifteenth and early sixteenth century. Put simply: the line was drawn through an absolute space which geographers were unable to measure with certainty using available technologies. It would not be until the mid-eighteenth century that Spain and Portugal would be able to utilize recent technological developments to amend the line prescribed by Tordesillas.

The territorial agreement sanctioned by the Treaty of Tordesillas utilized an understanding of territoriality drawn from principles of Roman Law common to the two

[59] There is an extensive literature on Tordesillas. For the most comprehensive collection, see: *El Tratado de Tordesillas y su Epoca: Congreso Internacional de Historia*, 3 vols. (Valladolid; Tordesillas; Setúbal: Junta de Castilla y León; V Centenario del Tratado de Tordesillas; Comemoraç ões Descobrimentos Portugeses, 1995). For the text of the Treaty, in its original languages and translated into English, see: Frances G. Davenport, ed., *European Treaties Bearing on the History of the United States and its Dependencies to 1648* (Washington, D.C., Carnegie Institution of Washington, 1917), 86–100.

[60] In 1529, this line was amended by the Treaty of Zaragoza, which defined an antemeridian line to that demarcated by Tordesillas.

Iberian nations.[61] It was this legal system that motivated the pronouncement to erect monuments of some size in the setting of the Line of Demarcation 370 leagues west of the Canaries:

> This said line shall be drawn north and south as aforesaid, from the said Arctic pole to the said Antarctic pole. […] And when determined by the mutual consent of all of them, this line shall be considered as a perpetual mark and bound, in such wise that the said parties, or either of them, or their future successors, shall be unable to deny it, or erase or remove it, at any time or in any manner whatsoever. And should, perchance, the said line and bound from pole to pole, as aforesaid, intersect any island or mainland, at the first point of such intersection of such island or mainland by the said line, some kind of mark or tower shall be erected, and a succession of similar marks shall be erected in a straight line from such mark or tower, in a line identical with the above-mentioned bound. These marks shall separate those portions of such land belonging to each one of the said parties; and the subjects of the said parties shall not dare, on either side, to enter the territory of the other, by crossing the said mark or bound in such island or mainland.[62]

As is apparent from the quote above, the construction of physical markers was required to convert this line from an abstract to an exact boundary. The actual location of the line, however, remained undefined. Although Ptolemaic geography created a system that allowed for the use of astronomic coordinates to define the Line of Demarcation, this was neither technologically feasible nor legally enforceable at this time.[63] Securing the title to

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[61] Lauren Benton, *A Search for Sovereignty: Law and Geography in European Empires, 1400--1900* (Cambridge: Cambridge University Press, 2010), 8, 22–23.

[62] Davenport, *European Treaties Bearing on the History of the United States and its Dependencies to 1648*, 96–97.

[63] While the grating created by longitude and latitude as defined in Ptolemaic geography allowed for the precise definition of locations on the globe, accurate measurement of coordinates could not be performed in the field. Solar measurements using the astrolabe allowed for measurement of latitudinal coordinates at sea and in the field, but no similar means of measuring longitude was available without knowledge of time. The invention of the marine chronometer in the eighteenth century made the measurement of both longitude and latitude in remote locations possible. For more on the problem of measuring coordinates in remote locations for mapping purposes, see: Norman J.W. Thrower, "Longitude in the Context of: Cartography," in *The Quest for Longitude: The Proceedings of the Longitude Symposium, Harvard University, Cambridge, Massachusetts, November 4-6, 1993*, ed by. William J. H Andrewes (Cambridge, Mass: Collection of Historical Scientific Instruments, Harvard University, 1996), 49–62; Alison Sandman, "Latitude, Longitude, and Ideas about the Utility of Science," in *Más allá de la Leyenda Negra: España y la Revolución Científica/Beyond the Black Legend: Spain and the Scientific Revolution*, ed by. Víctor Brotons and William Eamon (Valencia: Instituto de Historia de la Ciencia y

the Indies under Roman Law required Iberian monarchs to occupy and symbolically take possession of the land. The indeterminacy of Spanish claims of possession on maps of the Indies from this period caused by technological limitations would become one motivating factor for the Bourbon monarchy to commission surveying expeditions in the late eighteenth century.

At the dawn of the sixteenth century, European geographers were also working within the geographic models provided by Scholastic Aristotelianism and Renaissance Humanism, the latter influenced by incomplete editions of Claudius Ptolemy's *Geographia* and Strabo.[64] European conceptions of the world envisioned the globe as temperate zones or 'places.' These places were defined by their essential qualities, which, governed by celestial bodies, were then transferred onto their inhabitants, flora, and fauna.[65] Additionally,

> geography was hardly just a tool for locating, describing, or reaching the various parts of the inhabited world. As an art concerned with places, geography fully participated in the philosophical quest to apprehend the nature of all things placed; and as a discipline geography was closely tied to a range of other fields whose connections to one another were thought to obey the structure and functioning of an artificial universe.[66]

In the early sixteenth century, geographers lacked the technology required to locate the Papal Line of Demarcation that Tordesillas had defined.[67] Instead, Portuguese and

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Documentación López Piñero; Universitat de Valéncia; C.S.I.C., 2007), 371–381; María M. Portuondo, "Lunar Eclipses, Longitude and the New World." *Journal for the History of Astronomy*. 40 (2009): 249-276. In the late eighteenth century, we will see a contestation of legal regimes wherein astronomic coordinates and more historical Roman Law rites were simultaneously observed.

[64] W.G.L. Randles, "Science et cartographie. L'image du monde physique a la fin du XVe siècle," in *El Tratado de Tordesillas y su Epoca: Congreso Internacional de Historia*, vol. 2, 3 vols. (Valladolid; Tordesillas; Setúbal: Junta de Castilla y León; V Centenario del Tratado de Tordesillas; Comemoraç ões Descobrimentos Portugeses, 1995), 935–941.

[65] For more on Spanish geography leading into Tordesillas, see: Nicolás Wey Gómez, *The Tropics of Empire: Why Columbus Sailed South to the Indies* (Cambridge, Mass: MIT Press, 2008), 48–51.

[66] Ibid., 48.

[67] These inaccuracies would be revisited by the Treaty of Madrid (1750), which redrew the division between Portuguese and Spanish lands in Brazil. For more on this, see Chapter Three.

Castilian navigators brought Portolan charts and coastal navigational techniques into the Atlantic world.[68] These forms of navigation were reliant on latitudinal observations and on stops along a coastal itinerary to define place, a geographic epistemology that could scarcely approximate absolute position on the open ocean. The Line of Demarcation had been placed in the absolute space defined by lines of longitude and latitude, but it was immeasurable with the available technologies. In short, Iberian monarchs were ruling global empires with Mediterranean geographic methodologies. Early Iberian expansion into the Atlantic world had outpaced technological innovation.

Spanish Cosmography

Isabella and Ferdinand quickly recognized the need for greater geographic knowledge and in the early-sixteenth century established an institution in Seville for instruction in scientific navigation and the collection of accurate maps of the Indies – the Casa de la Contratación.[69] Additional mapping centers were founded to address practical concerns such as fortification, land surveying, and civil engineering during the sixteenth century. One such academy organized under Philip II was the Academia de Matemáticas in Madrid (f. 1582).[70] It was not coincidental that multiple institutions promoting

[68] This echoes conclusions drawn by Ricardo Padrón in: Ricardo Padrón, "Mapping Plus Ultra: Cartography, Space, and Hispanic Modernity," *Representations* 79, no. 1 (August 1, 2002): 28–60.

[69] For general overviews of this period of Spanish geography, see: David Buissert, "Spanish Colonial Cartography, 1450-1700," in *History of Cartography*, ed by. John Brian Harley and David Woodward, vol. 3, 3 vols. (Chicago: University of Chicago Press, 1987), 1143–1171; Alison D. Sandman, "Spanish Nautical Cartography," in *History of Cartography*, ed by. John Brian Harley and David Woodward, vol. 3, 3 vols. (Chicago: University of Chicago Press, 1987), 1095–1142; David Buissert, "Spanish Peninsular Cartography, 1500-1700," in *History of Cartography*, ed by. John Brian Harley and David Woodward, vol. 3, 3 vols. (Chicago: University of Chicago Press, 1987), 1069–1094.

[70] The Academia would not enjoy lasting success and quickly waned in the seventeenth century, see: M. I. Vicente Maroto and Mariano Esteban Piñeiro, *Aspectos de la ciencia aplicada en la España del siglo de oro* (Salamanca: Junta de Castilla y León, Consejería de Cultura y Turismo, 1991), 71-214; Juan Carrillo de Albornoz y Galbeño, *Los ingenieros militares Juan y Pedro Zermeño: paradigmas de la Ilustración*, (Cuadernos del Castillo de San Fernando) (Madrid: Ministerio de Defensa, 2012), 19–20.

geography were founded in the early sixteenth century. Rather, the Catholic Monarchs and their successors were keenly aware of the importance of sound geographic information to their imperial ambitions.[71] María M. Portuondo has described how at this time geography became a state secret, guarded in part through the state's monopoly on the publication of charts and navigational rudders.[72]

Two colonial geographic projects are representative of this early period of state geography. The first are the *relaciones geográficas*, which demonstrate the clashing of indigenous and European spatialities.[73] The second is the *Padrón Real*, a master chart kept at the Casa de Contratación that included all known geographical data and served as the official template for all state cartography.[74] Meanwhile, two major cartographic efforts on the peninsula also took place during this earlier period, the *Atlas de El Escorial* and *Atlas de Esquivel*.[75] It is especially noteworthy that although these projects were the result of the same desire to map the territories within the monarchy they functioned as discrete efforts. The *relaciones* and other attempts to map the Indies viewed the New World as inherently apart from Spain's possessions in Europe. Spanish geographers similarly represented Spain's peninsular territories – both the distinct historical kingdoms

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[71] See, e.g., Geoffrey Parker, "Maps and Ministers: The Spanish Habsburgs," in *Monarchs, Ministers and Maps: The Emergence of Cartography as a Tool of Government in Early Modern Europe*, ed by. James Akerman and David Buissert (Chicago: University of Chicago Press, 1992), 124–152; María M. Portuondo, *Secret Science: Spanish Cosmography and the New World* (Chicago: University of Chicago Press, 2009).

[72] Portuondo, *Secret Science*, 103–104.

[73] For more on this project, see: Barbara E. Mundy, *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas* (Chicago: University of Chicago Press, 1996); Barbara E. Mundy, "Hybrid Space," in *Mapping Latin America*, ed by. Jordana Dym and Karl Offen (Chicago: The University of Chicago Press, 2011), 51–55.

[74] For more on the *pardon real*, see Ricardo Padrón, "Charting Shores," in *Mapping Latin America*, ed by. Jordana Dym and Karl Offen (Chicago: The University of Chicago Press, 2011), 33–37; Portuondo, *Secret Science*, 95–102.

[75] For a background on these efforts, see: Buissert, "Spanish Peninsular Cartography, 1500-1700," 1083–1085; Antonio Crespo Sanz, "Los atlas de españa entre 1503 y 1810," in *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*, ed by. Mariano Cuesta Domingo and Alfredo Surroca Carrascosa (Madrid: Ministerio de Defensa, 2010), 179–186.

of the peninsula and the Habsburg territories – independently. It should be remembered that "national atlases have an iconic role, either by diffusing a sense of the naturalness of the nation or, more directly, by linking it to a particular political ideology."[76] This cartographic ideology, then, worked against the creation of a unified vision of the Spanish monarchy.

In 1517 Fernando Colón received a royal commission from Charles V to construct a peninsular map. Following a break in 1522 to attend Charles' coronation as Holy Roman Emperor, Colón abandoned the effort in 1523 and his papers were eventually sequestered by the state. In 1550s, Pedro de Esquivel was similarly ordered, either by Charles V or Philip II, to complete a comprehensive atlas of peninsular Spain. Esquivel worked diligently until his death in 1577, when the effort was given over to Juan de Herrera to complete. Alonso de Santa Cruz, the royal cosmographer at the Casa de la Contratación, likely also completed work for the *Atlas de El Escorial* during the middle decades of the sixteenth century.[77] Yet, these impressive compendia of geographic data remained unfinished and unpublished, relegated to the royal library of the Escorial.[78]

An Era of "Tapestry Geography"

When Catalonia, Portugal, and the Low Countries revolted in the mid-seventeenth century, the lack of available governmental maps forced the Spanish monarchy to resort to Abraham Ortelius' sixteenth century atlas for maps of the revolting regions.[79] A

[76] Jeremy Black, *Maps and Politics* (Chicago: University of Chicago Press, 1997), 114.
[77] Crespo Sanz, "Los atlas de españa entre 1503 y 1810," 181–184.
[78] Michael Biggs, "Putting the State on the Map: Cartography, Territory, and European State Formation," *Comparative Studies in Society and History* 41, no. 2 (1999): 382. The result of these efforts are preserved as part of the so-called *Atlas de El Escorial*, a manuscript collection of a single peninsular map and twenty regional sketches.
[79] Parker, "Maps and Ministers: The Spanish Habsburgs," 124.

monarchial crisis had revealed the monarchy's geographic ignorance of its peripheries. How had Spain reached this point? Far from the political and scientific savvy of Philip II, the reigns of Philip III and Philip IV failed to recreate Philip II's mastery of geography as a tool of governance. In fact, while Spanish royalty and military leaders were eager to collect and interpret cartographic examples during the sixteenth century, beginning in the seventeenth century the style of map used by Spanish rulers shifted towards ornate and inexact wall decoration more akin to tapestries than precise mathematical charts.[80]

It was during this later period of Habsburg Spain that a final effort to create a complete peninsular atlas began; an effort scholars have christened the *Atlas del Rey Planeta*.[81] The beginning of the reign of Philip IV brought about the most successful project to create an atlas of Spain, mandated by the Count-Duke Olivares and directed by Juan Batista Labaña. Three men conducted the surveys for this effort: Pedro de Texeira, who had worked on a previous effort to map Portugal, and two military engineers, Gabriel de Santa Ana and Pedro Fernández Manjón.[82] The work done by Texeira has received the greatest amount of scholarly attention, not only for its detail but also its military and administrative utility.[83] Most notable of this effort, however, was the continuing reluctance or inability to print the final comprehensive atlas. The identification of peripheral zones as sites of key interest to the monarchy in the surviving sketches, however, demonstrates the continuing value placed on state cartography. The Pyrenees, which Crespo Sanz labels a "conflict zone," were one example highlighted by

[80] Jesús Escobar, "Map as Tapestry: Science and Art in Pedro Teixeira's 1656 Representation of Madrid," *Art Bulletin* 96, no. 1 (2014): 50–69.

[81] Felipe Pereda and Fernando Marías, eds., *El Atlas del Rey Planeta: la descripción de España y de las costas y puertos de sus reinos de Pedro Texeira (1634)* (Hondarribia: Nerea, 2002).

[82] Crespo Sanz, "Los atlas de españa entre 1503 y 1810," 189.

[83] Antonio Crespo Sanz suggests that a collection of Texeira's sketches found in Vienna were meant as a gift to Philip IV. Ibid., 189–191.

Texeira to suggest that increasing investment and interest in overseas colonies were rendering the peninsula vulnerable to attack. While the importance of state cartography was not lost on the later Habsburg monarchs, Philip III, Philip IV, and Carlos II all struggled to match earlier cartographic production.[84] As a result, the completion of an accurate, comprehensive atlas of the peninsula proved elusive for each of the Spanish monarchs from 1492 until 1700.

Analysis of the state cartography associated with the reign of Philip IV has complicated earlier claims about declining map usage during his reign.[85] In fact, while Philip II had poured over manuscripts documenting his empire both visually and numerically, the geographic imagination of Philip III and Philip IV was represented in the tapestries that adorned their residences. Ornate and decorative, such descriptive geographies held little utility in the management of a trans-hemispheric empire. These tapestries might well have convinced Philip III and Philip IV of their global influence, but served no purpose in perpetuating that influence. Further, as Richard Kagan has shown, the geographic interests of the late Habsburg monarchs lay in urban centers, not peripheral regions.[86] The establishment of *civitas* and their centralizing plazas that demonstrated imperial order (*polícia*) worked to secure Spanish imperial order, but also ignored growing imperial threats to its periphery and hinterlands by European rivals.

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[84] Antonio T. Reguera Rodríguez, *Los geógrafos del Rey* (León: Universidad de León, 2010), 495.

[85] See, e.g., Pereda and Marías, *El Atlas del Rey Planeta*. Especially notable is the contribution of Richard Kagan, who argues for the cartographic fluency of Philip III and Philip IV: Kagan, "Arcana Imperii: Mapas, Sabiduría, y Poder a la corte de Felipe IV."

[86] Kagan, *Urban images of the Hispanic world, 1493-1793*; Richard L. Kagan, "Projecting Order," in *Mapping Latin America*, ed by. Jordana Dym and Karl Offen (Chicago: The University of Chicago Press, 2011), 46–50.

The Beginnings of Bourbon Reform

The Spain that Philip V inherited following Utrecht was a country imploding under economic duress, administrative inefficiency, and, finally, the continuing erosion of monarchical authority. Underlying all of these matters were the seeds of a growing imperial crisis that threatened to tear the empire apart. At the beginning of the eighteenth century, Philip V worked to counter these challenges by centralizing the state and solidifying its geographic vision as a unified Spanish monarchy.

As Philip V worked to reform Spanish governance, two ministers wielded tremendous influence over these reforms: Cardinal Giulio Alberoni and José Patiño. While these men shared certain qualities, they offered drastically different advice to the king. Alberoni was the first to serve at court, where he unsuccessfully attempted to mix Colbertian economic policy with traditional Spanish values. For example, he proposed investment in Spanish naval science but also limiting entrance to technical academies to members of the Spanish aristocracy. Alberoni also advanced a bullish foreign policy, attempting to reverse Spanish concessions at Utrecht in a matter of years. His provocations isolated Spain in European politics and led to Alberoni's ouster in 1719. José Patiño slowly rose within the Spanish government before becoming Prime Minister in 1726. Thereafter, Patiño guided Spanish reform with a more tempered approach than Alberoni. He initiated a reform of Spanish naval education and ship construction, measures that were vital to the larger geographic reform described by this dissertation.

While Spain had eventually united in opposition to the Austria Habsburg claim following Carlos II's death, tensions within Spanish society resurfaced when Philip V

finally ascended to the Spanish throne.[87] First was the question of Philip's nationality: could the new King of Spain really be French? Second was the issue of constitutional authority. Spain had long been a 'composite' state and its historically independent kingdoms, such as Aragon and Catalonia, enjoyed some degree of autonomy in the form of *fueros*, rights and privileges guaranteed to them by the Spanish king. Philip V needed to articulate both his sovereignty and the unity of the state. Philip first promulgated a centralization policy during the War of the Spanish Succession, responding in 1705 to the Catalan opposition to his ascension.[88] Philip wrote:

> I have judged it proper . . . to reduce all my kingdoms of Spain to the uniformity of one set of laws, usages, customs, and tribunals, with all being governed equally by the laws of Castile, which are so reasonable and praiseworthy throughout the whole universe.[89]

The novelty of this decree lay in its call for the erasure of legal and geographic distinctions on the peninsula. Beginning with the reign of the Catholic Monarchs, Ferdinand and Isabella, and continuing through the great expansions of Charles V and Philip II, Spain had been a composite state with each historical kingdom and new territory independently negotiating its rights and privileges with the crown.[90] Yet historians and geographers in eighteenth-century Spain would reflect on these early

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[87] Various factions within Spain had sided with each of the three claimants, most notably the support of the Cardinal of Castile for Archduke Charles. See: Elliott, *Imperial Spain*, 368–370; Lynch, *Bourbon Spain, 1700-1808*, 22–23.

[88] For his decree to centralize the many kingdoms of the composite monarchy, see: Fray Nicolás de Jesús Belando, *Historia civil de España y sucesos de la guerra y tratados de la paz*, vol. 1 (Madrid: Imprenta y Librería de M. Fernández, 1740), 316-18.

[89] Jon Cowans, ed., "Philip V, Decrees on Political Centralization (1707, 1716)," in *Early Modern Spain: A Documentary History*, trans by. Arthur Helps (Philadelphia: University of Pennsylvania Press, 2003), 203. These form part of the *Nueva planta* decrees issued by Philip V between 1707 and 1716.

[90] J. H. Elliott, "A Europe of Composite Monarchies," *Past and Present*, no. 137 (1992): 48–71; Anthony Pagden, "Heeding Heraclides: empire and its discontents, 1619-1812," in *Spain, Europe and the Atlantic World: Essays in honour of John H. Elliott*, ed by. Richard Kagan and Geoffrey Parker (Cambridge: Cambridge University Press, 2002), 316–333; I.A.A. Thompson, "Castile, Spain and the monarchy: the political community from 'patria natural' to 'patria nacional'," in *Spain, Europe and the Atlantic World: Essays in honour of John H. Elliott*, ed by. Richard Kagan and Geoffrey Parker (Cambridge: Cambridge University Press, 2002), 125–159.

monarchs and their expansions as founding the Universal Spanish Monarchy, viewing their reigns as the roots of Spanish political unity and global supremacy – two things that Bourbon Spain aspired to regain.[91]

With his *Nueva planta* decrees, Philip V had gone against two centuries of tradition and set Spain on the road to thorough reform.[92] He was not the first agent of the Spanish monarchy to attempt such restructuring – far from it – but his actions would be the catalyst for much needed change. Still, the rupture accompanying the shift from Habsburg to Bourbon Spain should not be overemphasized. Attempts at similar reform may be traced back to the Count-Duke Olivares; ministers serving under Carlos II had certainly made efforts to heal the ailing state as well.

The roots of the profound change that Spain experienced in the eighteenth century are to be found in the final decades of the seventeenth century. Following the political and economic disasters of the mid-seventeenth century, Spain had begun to recover through repopulation and agricultural output. The precipitous decline in receipts of American silver notwithstanding, John H. Elliott has shown that the decline of late seventeenth century Spain occurred relative to a wider seventeenth century European recession and that in Spain economic instability primarily affected Castile.[93] The seeds of change, however, were present long before the shift in monarchical lines. Beginning in the final two decades of the seventeenth century and continuing to the middle of the

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[91] See, e.g., commentaries on the creation of a global monarchy in: Real Academia de la Historia, *Diccionario Geografico-Historico de Espana*, 2 vols. (Madrid: En la Imprenta de la Viuda de D. Joachín Ibarra., 1802), xi; Luis María de Salazar, *Discurso sobre los progresos y estado actual de la hidrografía en España* (Madrid: Imprenta Real, 1809), 10-11.

[92] D. A. Brading, "Bourbon Spain and its American Empire," in *The Cambridge History of Latin America*, ed by. Leslie Bethell, vol. 1 (New York: Cambridge University Press, 1984), 391.

[93] John Elliott, "The Decline of Spain," in *Spain and Its World, 1500-1700: Selected Essays* (New Haven: Yale University Press, 1989), 217–240. See, as well, Elliott's introductory remarks on 'the question of decline:' John Elliott, *Spain and Its World, 1500-1700: Selected Essays* (New Haven: Yale University Press, 1989), 214–216.

eighteenth century, gradual growth of the Spanish population, rural agrarian economy, and urban centers of industrial production motivated state reform. These reforms aimed to support Spanish growth and reassert Spanish interests on the global stage.

Although Spanish society began to heal itself, reform leading to effective administration of the global monarchy would require purposeful action to promote intellectual production in the fields of political economy and geography. From the perspective of intellectual history, the last decades of the seventeenth and first decades of the eighteenth century ought to be viewed not as a period of abrupt changes, but as the initiation of reform that would become stronger in the second half of the eighteenth century during the Caroline period.

The Age of Novatores

Simultaneous to the economic recovery described above, an intellectual revival had also begun in Spain. The early introduction of modern philosophical thought to Spain during 1675 to 1725 came during a period of transition from Habsburg Spain to the House of Bourbon.[94] While conflict and isolation slowed this process, the period still saw the meaningful introduction of new thought and a moderate increase in intellectual production. While traditional narratives of Bourbon Spain have disregarded this earlier period, the existence of *novatores* (innovators) has been recognized for some time.[95] The

[94] As will become clear in due course, it is preferable here to speak of 'modern philosophy' or 'modern thought,' as opposed to the monolithic 'Enlightenment.' The latter term carries unbearable weight that would detract from the interests of the present argument. For more on the "modern" see the Introduction, pg. 2.

[95] Richard Herr's classic English language treatment of Spain in the eighteenth century is one example of a work that minimizes the important intellectual development of the *novatores*, instead focusing on the period following the ascension of Charles III, Richard Herr, *The Eighteenth-Century Revolution in Spain* (Princeton: Princeton University Press, 1958). Since the focus of this analysis is Spanish intellectual

novatores were individuals operating outside the university faculties who began to embrace the new philosophy in the late seventeenth century, especially its empiricism. Specifically focusing on natural philosophy, Olga Victoria Quiroz-Martínez has shown that Spanish intellectuals were engaging with the wider scientific trends of Europe during this early period, but struggled to reconcile Spanish Catholicism with the ideologies of mechanism and experimentalism.[96] Indeed, many of the early converts to modern philosophy adopted Cartesian mechanism with greater ease than its Newtonian counterpart because of their distrust of the latter's rigid mathematization of the world.[97] The period of the *novatores* was an era characterized by both empiricism and skepticism. Recently, Francisco Sánchez-Blanco has emphasized the role of Benito Jerónimo Feijóo (1676-1764) in the popularization of modern thought in Spain, suggesting that the Benedictine epitomized the period. Others, notably José Manuel Souto Rodríguez, have viewed Feijóo as a transitional figure between the *novatores* and later 'enlightened' individuals.[98] While earlier works labeled Feijóo as a mere conduit through which Enlightenment thought was filtered as it trickled into Spain, Sánchez-Blanco argues that Feijóo's publications show a *sabio* engaged in widespread discussions and exercising influence over his compatriots.[99] Despite these signs of early engagement with

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history, I will use the neutral, temporal label of Caroline period, rather than the more charged 'Bourbon Reforms' or to make a claim for 'Spanish Enlightenment.'

[96] Olga Quiroz-Martínez, *La Introducción de la Filosofía Moderna en España: el Eclecticismo Español de los Siglos XVII y XVIII* (D.F., México: Colegio de México, 1949). See also José María López Piñero, *La introducción de la ciencia moderna en España.* (Barcelona: Ediciones Ariel, 1969); José Manuel Souto, *El siglo XVIII español: cultura, ciencia y filosofía* (Madrid: Mileto Ediciones, 2004).

[97] Souto, *El siglo XVIII español*, 121.

[98] Souto names three key transitional figures: Gregorio Mayans y Siscar (1699-1781), Andrés Piquer (1711-1772), and Benito Jerónimo Feijóo. Ibid., 126. Two other figures that have been associated with this influx of new intellectual currents include Gaspar Melchor de Jovellanos (1744-1811) and Pedro Rodriguez, conde de Campomanes (1723-1802). For discussion of Jovellanos and Campomnanes, see, respectively, Ibid., 137–194; Gabriel B. Paquette, *Enlightenment, Governance and Reform in Spain and Its Empire, 1759-1808* (New York: Palgrave Macmillan, 2008).

[99] Francisco Sánchez-Blanco, *La mentalidad ilustrada* (Madrid: Taurus, 1999), 63–122.

Enlightenment, it must not be forgotten that these intellectual currents were only being embraced by a small portion of society and were not accepted by the university faculties.

One reason for the relatively limited acceptance of modern philosophy in Spain at this time was conflict amongst Spanish educational institutions beginning in the mid-seventeenth century. Decline in technical education was partially due to tensions between the relatively progressive Society of Jesus, which gained a virtual monopoly on technical education in Spain, and faculty from the traditional universities such as Salamanca and Alcalá, whose curriculum remained heavily influenced by medieval scholasticism. Further, the ban imposed by Philip II against Spaniards studying abroad dealt a tremendous blow to natural philosophy in Spain, including the geographic sciences. Technical colleges in Milan and the Low Countries, both part of the Spanish Habsburg empire, grew during this period, absorbing the technical and methodological innovations of the wider European Scientific Revolution. While in peninsular Spain, the Jesuit Colegio Imperial replaced smaller technical academies, for example absorbing the chair in mathematics (*cátedra*) from the Academia de Matemáticas in Madrid.[100] The Colegio Imperial failed to produce both the volume and the quality of technicians seen in sixteenth century Spain, however. In John H. Elliott's characterization of the period:

> At a moment when inquiring minds in other parts of Europe were turning towards philosophical and scientific investigation, the spirit of inquiry was almost dead in Castile. There were still isolated groups of devoted scholars, but educational standards had slumped, as the universities fell back on the most arid Thomism and showed themselves hostile to any sign of change.[101]

As suggested before, there were pockets of modern thought arising in late-seventeenth century Spain. They simply were not centered in Castile or at the traditional universities.

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[100] Vicente Maroto and Esteban Piñeiro, *Aspectos de la ciencia aplicada*, 162-173.
[101] Elliott, *Imperial Spain*, 362–363.

These new intellectual currents were promoted and developed in institutional settings outside of the traditional university faculties or the influence of the Society of Jesus.[102] Seville, for example, witnessed the formation of medical societies for the advancement of experimental philosophy. Sevillian physicians quickly faced challenges, however, from medical regulatory *juntas*, restricting their ability to practice freely in the medical marketplace.[103] It was through small, intimate gatherings centered in Madrid, Seville, and Valencia that the *novatores* were able to investigate questions heterodox to Spanish Catholicism and embrace the new philosophical currents.[104]

The intellectual development of the late-seventeenth century, characterized by its skepticism, opened up the possibility for the *ilustración* of the eighteenth century. The latter, a period of rapid change, was epitomized as much by embrace of natural philosophy as by a rejection of the baroque. The intimate gatherings of the *novatores* were replaced by institutional settings for natural philosophy, predominantly in the form of economic societies and military academies.

New Geographic Institutions

While the War of the Spanish Succession was being waged on both sides of the Atlantic, Philip V and his ministers endeavored to reform administrative and monarchial

[102] Jorge Cañizares-Esguerra has decried the lack of scholarly attention on Spanish science during the seventeenth century in general, arguing that scholars have only cared for the early successes of the sixteenth and revival of the eighteenth centuries. See: Jorge Cañizares-Esguerra, "Chivalric Espistemology and Patriotic Narratives: Iberian Colonial Science," in *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World* (Stanford, Calif: Stanford University Press, 2006), 9.

[103] José Pardo Tomás and Àlvar Martínez Vidal, "Las consultas y juntas de médicos como escenarios de controversia científica y práctica médica en la época de los novatores (1687-1725)," *Dynamis: Acta Hispanica ad Medicinae Scientiarumque Historiam Illustrandam* 22 (June 3, 2008): 303–325; Elliott, *Imperial Spain*, 367.

[104] Souto, *El siglo XVIII español*, 120–124; Julián López Cruchet, "El filósofo Juan de Nájera y la Ilustración en España," *Anales del Seminario de Historia de la Filosofía* 20 (January 1, 2003): 269 – 283.

structures that had persisted under the Spanish Habsburgs. Among their first objectives was restructuring the institutional structure dedicated to education in two interrelated subjects: navigation and military science. Although both subjects pursue questions posed by geographers, such as that of the shape of the earth, their initial reform under Philip V was not motivated by philosophical inquiry but, rather, by the pursuit of technical precision. That is, the pragmatic reforms begun by Philip V and his ministers asked how and not why certain methods, for example, could increase navigational precision over long voyages. The early incorporation of geography into state reform was due to the role geographic knowledge served in the broader aims of Bourbon Reform. As John Pickles has argued: "the map is a hidden (or not so hidden) tool – a plan – for delimiting the environment and the practices that take place in it. But it is also an explicit tool for the transformation of social, economic and political spaces of the state."[105] Reform of governance, then, sought useful geographic information, which in turn sought greater precision through the development of new mathematical and technical methodologies.

What, however, was meant by geography at this time? From the Renaissance to the dawn of the eighteenth century, early modern Europe experienced rapid, widespread developments in the science of representation and the philosophy of place underpinning cartographic representation. While advancements, both technological and natural philosophical, changed the representative ability of geography, its practitioners debated the objectives of their simultaneously ancient and nascent discipline. While the practical arts of navigation spurred developments in mapping and astronomy, cosmographers sought a framework to explain the world that encompassed geography, natural history,

[105] John Pickles, "Mapping the geo-body: State, territory and nation," in *A History of Spaces: cartographic reason, mapping, and the geo-coded world* (London; New York: Routledge, 2004), 111.

and ethnography.[106] Viewing the origins of geography in the works of Ptolemy, Hippocrates, and Strabo for inspiration, many European geographers came to agree only on the origins of their discipline, disagreeing on both its practice and focus. In Spain, expansion into the Indies challenged cosmographers' perceptions of space and the tools used to represent it, while natural philosophers faced "information overload" attempting to reconcile their taxonomic schemes with New World flora and fauna.[107] By the eighteenth century, however, these tensions had been reconciled and thus the focus of natural philosophers shifted, as well. In Spain, as elsewhere in early modern Europe, a notable shift took place: *cosmography* became *geography* (and its related sub-disciplines).[108] This shift was characterized by an increasing emphasis on objectivity and observational data – especially noticeable in the predominance of mathematical cartography – while the more subjective elements of cosmography were deemphasized by geographers or morphed into distinct disciplines. María M. Portuondo has clearly shown the predominance of a cosmographical imperative in the Spain of Philip II, but by 1782 Manuel de Aguirre was comfortable defining a geography concerned with practicality as the premier discipline in Spain.[109] To understand this shift this chapter will now turn to focus on the institutions that promoted the new geographical standards.

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[106] For more on the definition and practice of cosmography, see: Portuondo, *Secret Science*, 1–4; Klaus A. Vogel, "Cosmography," in *The Cambridge History of Science*, ed by. Katherine Park and Lorraine Daston, vol. 3, 4 vols. (Cambridge: Cambridge University Press, 2006), 469–496.

[107] Padrón, "Mapping Plus Ultra"; Ann M. Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age* (Yale University Press, 2010), 11-61.

[108] For an eighteenth century definition of geography, see Michel Delon, ed., *Encyclopedia of the Enlightenment* (Chicago, IL; London: Fitzroy Dearborn Publishers, 2001), vol. 1: 583. For the relation between geography and other disciplines in the eighteenth century, see Richard Yeo, "Classifying the Sciences," in *The Cambridge History of Science*, ed by. Roy Porter (Cambridge: Cambridge University Press, 2003), 251–254.

[109] For Aguirre's reflections, see "Indagación y reflexiones sobre la geografía: con algunas noticias previas é indispensables," Manuscritos, Real Academia de Historia [M-RAH] 13/945, f. 2-3.

At the same time that Spain was selectively absorbing intellectual stimulus from Europe, its military was being reformed in response to growing tensions and conflict. It was during the War of Spanish Succession that the precipitous decline of the Spanish navy first became evident. While the British navy controlled more than one hundred ships-of-the-line, the latest style of military vessel, Spain commanded twenty warships and was reliant on the French navy to buttress its maritime defenses during the war. After the conflict's end, naval reform found its center in cities with longstanding links to Spanish commercial and military interests in both the Atlantic and Mediterranean: Cádiz, Ferrol, Cartagena, Mahón, Guarnizo, Pasajes, San Feliú de Guixols, Havana, Guayaquil, and Manila. While Gibraltar would have been a natural addition to this list, it had been ceded to Great Britain at Utrecht. The navy faced a series of challenges simultaneously: the development of a shipbuilding program, the consolidation of the many scattered regional navies into a powerful national force, the growth of the navy through recruitment and conscription, and, finally, the education of a new class of modern officer to lead that navy.

The regional naval squadrons were disbanded following the creation of a single Royal Navy (*Real Armada*) by royal order on February 14, 1717.[110] The varied needs of the Spanish navy would be met with the formation of new institutions to regulate naval architecture, commerce, and military interests. As naval development progressed, three cities quickly became associated with the new Spanish navy: Cádiz, Ferrol, and Cartagena. As a part of the professionalization of Spanish naval power, administration of the armada became independent from the commercial interests of the Casa de la

[110] Lynch, *Bourbon Spain, 1700-1808*, 127. Equally vital to reform was the organization of naval architecture in Spain utilizing natural resource from throughout the kingdoms to create a self-sufficient shipbuilding program.

Contratación in Seville. The Royal Academy of Naval Cadets (*Real Academia de Guardiamarinas*) in Cádiz, Spain's first naval academy, also opened in 1717.[111] The Academy had been charged by José Patiño (1666-1736), the newly appointed naval minister, with educating young Spaniards in the skills needed for Spain to regain her status as the preeminent maritime nation. This goal, however, was easier proclaimed than met. During the earliest phases of the naval reform, British observers could continue to express confidence in their naval superiority. In fact, Sir Benjamin Keene, the British Ambassador to Spain, observed from Seville in 1731 that Spain had "about forty ships of the line, and large frigates, but not sailors even to navigate the half of them, and their sea officers do not deserve that name."[112] It would not be until 1752, with the appointment of Louis Godin (1704-1760) as director of the Academy of Naval Cadets, that the institution would begin to meet expectations towards returning Spain to maritime preeminence.[113]

Naval reform was not isolated or unique in early Bourbon Spain, however. In fact, a variety of military institutions for the specialized training of officers were founded or reformed at this time, including academies for officer training in artillery (Barcelona and Cádiz), an academy for the corps of civil guards (Madrid), a naval surgical college (Cádiz), and national organizations for naval engineers and higher mathematics (Barcelona, Orán, Ceuta, Madrid, and Cádiz); all organized between 1730 and 1750. These schools sought to "improve the education of officers in mathematics, physics,

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[111] For an account of these early years of this academy (in relation to one of its most famous pupils), see Emilio Soler Pascual, *Viajes de Jorge Juan y Santacilia: ciencia y política en la España del siglo XVIII* (Barcelona: Ediciones B, 2002), 21–29.

[112] Keene to Newcastle, Seville, 2 March 1731, PRO, SP 94/107, quoted in Lynch, *Bourbon Spain, 1700-1808*, 129.

[113] Louis Godin was a member of the Académie des sciences and the leader of the 1735 expedition to measure the global meridian in Quito, which two Spaniards (Jorge Juan and Antonio de Ulloa) accompanied. For a synopsis of his life, see Seymour L. Chapin, "Godin, Louis," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008). For more about Godin's relationship to the Academy, see Chapter Four, pg. 191.

fortification, raising of charts and artillery."[114] One institution revived during this period was the Academia de Matemáticas in Madrid, which had been founded in 1582.[115] Graduates of this academy were educated, in part, by French military engineers who had fought alongside Spanish forces during the War of the Spanish Succession. The French officers assisted Spanish military engineers contributing to Spanish reform civil engineering, such as the project to improve road networks and unite the Spanish provinces. Spanish military engineers would also participate in the demarcation of the Pyrenean boundary in the late-eighteenth century.

Spanish Geography and International Science - The Spanish-French Geodetic Mission (1734-1742)

As part of the revival of military education described above, Spanish military officers were sent to accompany foreign scientific voyages passing through the Americas. Early Bourbon scientific voyages, whose missions were almost always in part geographic, were characterized by the inclusion of naval personnel. Additionally, these first efforts developed in a "multinational" or "international" model, first as the Spanish-French geodetic mission to measure the global meridian in Quito (1735-1742) and, subsequently, the Spanish-Swedish expedition to the Orinoco (1754-1761).[116]

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[114] Antonio Lafuente and José Luis Peset, "Las Academias Militares y la inversión en ciencia en la España ilustrada (1750-1760)," *Dynamis: Acta Hispanica ad Medicinae Scientiarumque Historiam Illustrandam* 2 (1982): 196.

[115] For more on this institution, see Martine Galland Seguela, *Les ingénieurs militaires espagnols de 1710 à 1803: étude prosopographique et sociale d'un Corps d'élite*, Bibliothèque de la Casa de Velázquez, 40 (Madrid: Casa de Velázquez, 2008), 13–68; Carrillo de Albornoz y Galbeño, *Los ingenieros militares Juan y Pedro Zermeño*, 19–20; Vicente Maroto and Esteban Piñeiro, *Aspectos de la ciencia aplicada*, 71-214.

[116] The Spanish-French mission has received extensive scholarly focus, for one informative account see: Neil Safier, *Measuring the New World: Enlightenment Science and South America* (Chicago: University of Chicago Press, 2008). For more on the later expedition, see the informative description by

Of these two expeditions, the Spanish-French geodetic mission has received the bulk of attention. In the first decades of the eighteenth century, the French Academy of Sciences dispatched a pair of expeditions to help settle a longstanding conflict between Newtonians and Cartesians regarding the shape of the Earth. One, directed by Pierre Maupertius, went north to Lapland in the polar region, while the second, directed by Luis Godin and, later, Charles Marie de La Condamine (1701-1774), traveled to the equator in the territory of Quito.[117] Accompanying the French party to Ecuador would be two Spanish naval officers, Jorge Juan (1713-1773) and Antonio de Ulloa (1716-1795), whose presence had been a condition of Philip V's approval for the expedition party to enter Spanish territory. Their presence was not vital to the success of the mission, although they performed useful scientific and political activities. It is also worth noting of Juan and Ulloa's involvement that at just 21 and 19 years of age, respectively, they were learning from as much as participating in the geodetic expedition. The expedition party met on the north Caribbean coast in Cartagena de India in 1735, departing south from there down the Peruvian coast. Along with their astronomic purpose, the expedition party studied natural history, conducted surveys of various inlets, and monitored both the economic potential and political climate of the region. Juan and Ulloa, part of the first generation to benefit from the reforms in military education, were also entrusted with secret instructions to covertly study both colonial attitudes and French territorial

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Antonio González Bueno: "Pehr Löfling in the Orinoco: a disciple of Carl Linnaeus in the Orinoco (1754-1756)," Real Jardín Botanico de Madrid, accessed 27 March 2013, http://www.rjb.csic.es/jardinbotanico/jardin/index.php?len=en&Pag=87

[117] For accounts of each voyage, see: Mary Terrall, *The Man Who Flattened the Earth: Maupertuis and the Sciences in the Enlightenment* (Chicago: The University of Chicago Press, 2002); Safier, *Measuring the New World*.

encroachment.[118] Following the expedition's completion, the French and Spanish participants would each publish recollections of their travel and experimental results, while Juan and Ulloa also began influential careers in Spain.[119]

In his account of the voyage, Jorge Juan opens with a brief history of astronomy. While reviewing the history of astronomic observation and astronomical technologies, Juan subtly argues that modern astronomic activities were consistent with both the best scientific intentions of a European nation and the traditions of the Catholic Church. Astronomy, Juan notes, served two purposes for the expedition.[120] The first, international in scope, was to finally settle the Newtonian-Cartesian debate regarding the shape of the earth and the length of a terrestrial degree. The second, purely nationalistic, concerned the improvement of geographic and navigational knowledge of the region.

Still, it is apparent from his introduction that for Juan knowledge of nature was always in part political. The expedition to Quito had not only settled an international scientific debate, it had also revealed to a greater extent the Laws of Nature. Juan acknowledged the magnitude of these results while praising the united monarchial house that had sponsored the expedition:

> [K]knowledge of gravity and [of] the heaviness of bodies, [is] perhaps the most important [question] in all of physics, because this is the universal Agent that God uses most prominently in the governance of nature. … Some Monarchs, as wise

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[118] Manuel Casado Arboniés, "Bajo el signo de la militarización: las primeras expediciones científicas ilustradas a Suramérica (1735-1761)," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed by. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 30–33.

[119] For the Spanish account, see: Biblioteca Nacional de España (BNE) 2/53704: Jorge Juan et al., *Observaciones astronómicas y phisicas hechas ... en los Reynos del Perú por D. Jorge Juan ... y D. Antonio de Ulloa ... de las quales se deduce la figura y magnitud de la Tierra y se aplica a la Navegación* (En Madrid: por Juan de Zuñiga, 1748). For the results of their covert activities, see: Jorge Juan and Antonio de Ulloa, *Noticias secretas: sobre el gobierno, administración de justicia, estado del clero y costumbres entre los indios del interior* (Barcelona: Crítica, 2010).

[120] Juan et al., *Observaciones astronomicas y phisicas hechas ... en los Reynos del Perú [Texto impreso]*, prólogo.

> and circumspect as those of the Royal House of Bourbon, without question the generous mother of all science in Europe, have expended great sums … [Their agents in America working] solely to uncover this truth, fighting vehemently for the incomparable magnificence of the Monarchs, with [the] zealous [and] obedient diligence [of its] vassals, in order to be useful, not only to the *Patria* but also to the rest of the world [*Orbe*].[121]

This sort of rhetoric was stylistically expected in the era. The message was that Juan and Ulloa were acting on behalf of their King, who was in turn acting on behalf of the entire world in uncovering these Laws of Nature. If the stars moved by God's laws, Juan remained aware that, in improving geographical measurement of the colonies, those same stars were reinforcing the King's laws and claims of sovereignty. Such was the double face of geography in the eighteenth century.

Juan's calculations of the measurement of the global meridian in his published account validated his status as a modern scientist. Precise and elegant, they consist of mathematical proofs and not technical calculations; Jorge Juan presented his mathematical arguments in a manner that asserted himself as the intellectual equal of La Condamine and the other French academicians. The astronomical prowess exhibited by Juan may seem odd given that he maintains a skeptical attitude towards the heliocentric Newtonian world system that was governed by universal laws that had problematic implications for Catholic belief. It may simply have been impossible for Juan to publish his observations with royal approbation without also including a note clarifying his personal belief in Catholic teachings. For eighteenth-century Spaniards, Juan and Ulloa

[121] Ibid., xxv–xxvi. "*el conocimiento de la gravedad, y de la pesadez de los Cuerpos, acaso el mas importante de toda la Phísica , pues este es el Agente universal de que Dios se sirve mas principalmente para el govierno de la naturaleza ... unos Reyes tan sabios y circunspectos como los de la Real Casa de Borbón, generosa Madre sin disputa de las Ciencias en Europa, han expendido sumas increíbles ... los mas trabajosos afanes, solo por averiguar esta verdad; peleando á porfía la incomparable magnificencia de los Monarcas, con la zelosa obediente diligencia de los Vasallos , por hacerse útiles, no solamente á la Patria, sino también á todo el resto del Orbe*."

became heroes and represented the highest aspirations for Spanish science.[122] Whether the geodetic project had been of Spanish or French origin was inconsequential, all that was remembered was the rapid progress from embarrassment and defeat in 1713 to scientific achievement in 1735.

The Spanish-French geodetic mission was not the only expedition that exemplifies Spanish geographic science during the first half of the eighteenth century. In fact, the military and monarchial centers did not possess a monopoly on geographic description of the trans-oceanic empire. Jesuits still served as *de facto* geographers of the Americas, at least until their expulsion in the 1760s. Further,

> ecclesiastical and viceregal administrations were not mere appendixes [sic.] of the home country's power but were organizations with enough political and economic autonomy to promote their own expeditionary efforts according to specific objectives and cultural projects – which might have been different from those of the Spanish Crown.[123]

The early-eighteenth century, then, was a chaotic moment in Spanish geography, with multiple institutions and actors working on sometimes harmonious and sometimes discordant projects. Interestingly, the revival of geography in Bourbon Spain was first directed to projects in the colonial sphere before its influence would be felt on the peninsula. On both sides of the Atlantic, however, the military, the Catholic Church, and local administrators attempted systematic territorial surveys with varying degrees of success.

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[122] This heroic status has not declined among contemporary Spaniards, either, as Juan is held as emblematic of the *ilustración*: Magdalena Martínez Almira, *Jorge Juan y las ciencias bajo el signo de la monarquía ilustrada* (Madrid, España: Alicante, 2002).

[123] Antonio Lafuente and Leoncio López-Ocón, "Scientific Traditions and Enlightenment Expeditions in Eighteenth-century Hispanic America," in *Science in Latin America: A History*, ed by. Juan José Saldaña, trans by. Bernabé Madrigal (Austin: University of Texas Press, 2006), 123.

Conclusion

The War of the Spanish Succession reconfigured pan-European geopolitics. Spain's concessions of territory spared the partition of its trans-Atlantic empire, but the European empire was in shambles and the vulnerabilities of its American holdings laid bare for the world to see. At Utrecht, Spanish ministers witnessed British and French practices of cartographic diplomacy and were reminded of the utility of accurate geographic knowledge for effective governance. During the reign of Philip V, Spanish reformers began to adapt elements of these British and French geographic practices to the unique challenges faced by Bourbon Spain. Spanish ministers had ceded Gibraltar, Naples, and other valuable territories at Utrecht, they granted Great Britain the *asiento*, neither Philip nor his ministers were willing to concede the Universal Spanish Monarchy.

The response to these concessions was a rapid reform of the military, beginning with instruction in military sciences including artillery, navigation, and surveying. These were the seeds of the subsequent Caroline geographic reform, planted not for idealistic but rather pragmatic purposes. In addition to this pragmatism, yearning for the global supremacy of Golden Age Spain also drove Bourbon geographic reform and the prefaces of Bourbon geographic publications include specific references to the earlier accomplishments of Habsburg geography. Although frustrated by the paucity of cartographic production under the late Habsburg monarchs, the Bourbon ministers who would be instrumental in integrating geography into their reform programs, men such as Ensenada, Floridablanca, and Campomanes, were also haunted by the vast geographic output of Philip II. Spanish efforts to reclaim European predominance in the eighteenth

century pitted Spain not only against contemporary British, French, and Dutch competitors but also against the memory of Spain's great sixteenth century achievements.

Introduction to Part II
Spanish Geography on the Eve of Caroline Reform

Beginning under Philip V, the acute loss experienced by Spain in the War of the Spanish Succession had motivated a reinvestment in both the military and the state apparatus. Military institutions overseeing the technical education of officers were reorganized at mid-century, with promising graduates dispatched to the colonies to conduct surveys. Spanish geographers and technicians were also sent to European capitals to gain technical training during the reign of Ferdinand VI (r. 1746-1759). While the successful reforms led by Philip V and his ministers had made the goal of implementing geographically sophisticated methods of governance appear achievable; by mid-century the reform program needed new leadership. The 1740s and 1750s witnessed an important shift in geographic reform under the leadership of Zenón de Somodevilla, marqués de la Ensenada, and one of the principal ministers of Ferdinand VI. Enseanda was driven by an idealistic, utopian vision of the scientific state. The policies of state reform implemented under his leadership sought to create a centralized and unified Spanish nation. He believed this goal could be achieved by the state embracing scientific and technological reform projects as part of the process of unification. These projects would include commissioning national surveys to produce cartographic images promoting the vision of a politically unified Spain and civil engineering projects, such as canalization and roadwork, which would unite Spanish regional industries. Ensenada's promotion of the education of Spaniards abroad, immigration of foreign technicians, centralization of state infrastructure, and dedication to scientifically guided reform

informed by demographic data and cartographic imagery sparked rapid development of the state project.

In fact, by 1750 Spanish cartographic capabilities had developed sufficiently for governmental ministers to employ diplomatic cartography to settle long simmering issues of the Ibero-American boundary. The Treaty of Madrid (1750) was accompanied by an ambitious boundary demarcation survey that lasted until the final decades of the eighteenth century. The mid-century negotiations of a new Ibero-American boundary show Spain asserting itself internationally on the basis of state-sponsored geographical science. The boundary survey also allowed for reform of the economic system of the colonies, as has been traced by many previous studies of the Bourbon Reforms.

King Ferdinand VI's reign proved to be a period of extreme tension between ministers who recommended that Spanish governance be radically reformed and ministers who championed a far less progressive reform program. Powerful personalities debated the future of the Spanish monarchy both publicly and in court documents throughout the period. Ferdinand's reign marks a high and a low for reform in Bourbon Spain. Shrewd governance had created financial surplus and a strong nationalist attitude drove reform and progress, however foreign influence derailed this process and vilified many of the progressive reformers. Despite the premature dismissal of the marqués de la Ensenada from the government, the reformist attitude he exemplified persisted beyond the end of Ferdinand's reign and passed on to a new generation who would surround Ferdinand's brother and successor – King Charles III.

Part II studies the development of state science under Ensenada's leadership, and then its mobilization as part of international diplomacy. The use of geographical methods

described herein shows how Bourbon Reforms matured in the period between the reign of Philip V and the more studied period of Spanish science coinciding with the reigns of Charles III and Charles IV. Chapter Two examines state reforms led by the marqués de la Ensenada and describes his particular vision for a scientific Spain, especially the prominent role geography would play in an Ensenadean Spain, while Chapter Three follows the development of the Ibero-American boundary in the Amazon where the new geographical program was implemented. Treating these interrelated narratives in successive chapters allows the reader to see ministerial objectives for geographic reform and the implementation of these reforms in a specific region of the global Spanish monarchy.

Part II
Chapter Two
Ensenadean Reform: Geographic Science and the Influence of the Marqués de la Ensenada on Bourbon Reform

On April 11 1743, King Ferdinand VI elevated Zenón de Somodevilla y Bengoechea (1702-1781), a middle-aged Spanish naval officer, to office of Minister of Finance, War, Navy and the Indies. The Spanish Zeno – a burdensome name, whose intellectual weight he seemingly never acknowledged – was a beguiling statesman, flouting the mold of Spanish aristocratic minister. Indeed, little is known of Zenón's childhood or family life.[1] He entered Spanish civil administration as a naval clerk in the 1720s, one of many Spaniards who experienced some degree of social mobility into the booming middle class under Bourbon rule. Just ten years later, Zenón would receive the title of marqués de la Ensenada from King Charles of the Two Sicilies – the future Charles III of Spain – for his efforts in securing Charles his Italian throne. Distrusted by the old nobility during the height of his power, Ensenada pursued an ambitious and comprehensive program of state reform that balanced the centralization of power domestically with the expansion of power internationally. At the heart of both goals would be the advancement of Spanish geographic science.

The present chapter studies the role of the geographical sciences in state reform during the period coinciding with the height of the marqués de la Ensenada's influence and power. Ensenada's role in promoting and advancing geographical science in Spain,

[1] Antonio Rodriguez Villa presents the most complete biographical details in his nineteenth century memorial, *Don Cenon de Somodevilla, marqués de la Ensenada*, but even these are vague and focus more on Ensenada's regional identity than his family life. Ensenada was born on, or around, 2 June 1702 in either Alesanco or Hervías, near Logroño in La Rioja. While Rodriguez Villa labels Ensenada's parents as being "noble," critics of Ensenada's policies certainly contested any such familial heritage. See: Antonio Rodriguez Villa, *Don Cenon de Somodevilla, marqués de la Ensenada* (Madrid: Librería de M. Murillo, 1878), 1–3; 307.

as well as his use of geographical data to support his program of reform will be highlighted. The chapter begins with a survey of the political dynamics of the government of Ferdinand VI, including Ensenada's rise to prominence and fall from grace. In order to better understand Ensenada and his contemporaries' expectations of the benefits that science and technology could provide a modern state, this chapter will discuss the *Sinapia* – a techno-scientific utopian novel contemporary to Ensenada – to consider the ideology behind a program of state reform such as the one Ensenada tried to implement. Finally, this chapter will consider three specific efforts that illustrate the role of geography in state reform at this time. These examples demonstrate how the Ensenadean reforms were informed, in no small measure, by the ideology manifested in *Sinapia*, but also by a geographic imagination that conceived of Spain as a unitary, centralized state.

Politics and the Government of Ferdinand VI

The reign of Philip V – stretching from 1700 to 1746, nearly uninterruptedly – brought forth a series of reforms in both Spanish statecraft and culture.[2] Still, history has judged Philip's reign somewhat harshly. John Lynch, notably, argued that Philip's reforms were minimal and focused on Europe at the expense of the Atlantic world.[3] Even in Europe, however, when competition arose between Spanish and French interests,

[2] Philip's rule was interrupted in 1724 when his son, Luis I of Spain, reigned for seven short months before succumbing to smallpox. Upon Luis' death, Philip, who had abdicated in his son's favor, reluctantly returned to the throne and ruled until 1746. In all, three of Philip's ten children would rule as King of Spain: Luis I, Ferdinand VI, and Charles III.

[3] Lynch argued as much some twenty-five years ago, but more recent reflections on Spanish state policy have echoed his conclusions. See, e.g., John Lynch, *Bourbon Spain, 1700-1808* (Oxford, UK: B. Blackwell, 1989), 163–164; Allan J. Kuethe and Kenneth J. Andrien, *The Spanish Atlantic World in the Eighteenth Century: War and the Bourbon Reforms, 1713–1796* (New York: Cambridge University Press, 2014), 3–4; J. H. Elliott, *Empires of the Atlantic World: Britain and Spain in America, 1492-1830* (New Haven: Yale University Press, 2006), 231.

scholars have concluded that Philip and his favorite, Cardinal Julio Alberoni, put the interests of his grandfather, Louis XIV of France, ahead of those of Spain. The strong attachment between Philip, his ministers, and France remained a controversial subject of debate throughout the Bourbon period and was at the heart of the public disdain some Spaniards voiced toward the Bourbon monarchy.[4] Throughout the reign of Philip V, a general trend toward empowering central authority at the expense of regional or provincial bodies may be observed, all the while leaving political influence the prerogative of the landed aristocracy. When Philip V died in 1746, his second son ascended to the throne as Ferdinand VI (r: 1746-1759). In contrast to his father, Ferdinand VI assumed the persona of a Spanish nationalist. While Philip had remained haunted by the specter of Spanish loss in 1715, Ferdinand, instead, pursued peace and a stronger Spanish investment in reform programs both at home and in the Atlantic world, content to relegate, for the time being, Spanish losses at Utrecht to historical memory. Zenón de Somodevilla, the marqués de la Ensendada, was central to the implementation of these policies by Ferdinand's new administration.

Little is known about Zenón de Somodevilla before he began a career in civil administration as a naval clerk, but he was largely regarded as a self-made man. Service as a clerk at the naval depot in Cueta effectively served as Zenón's informal education. Following additional naval service, including the campaign to recapture Orán in 1732, José Patiño, chief minister to Philip V, recognized Zenón's natural abilities and promoted him to oversee the naval arsenal in Ferrol. Following additional administrative work, Charles rewarded Zenón with the title of marqués de la Ensenada in 1736 in recognition

[4] It should also be noted that Cardinal Alberoni and José Patiño were of Italian heritage, which also displeased Spanish nobility.

of his command of naval forces in 1733 central to the recapture of Orán that had helped secure Charles' Neapolitan throne. The following year, Ensenada completed his rapid ascent when he was named Secretary of the Admiralty. When José de Campillo – Philip's powerful minister – died in 1743, Ensenada was the logical replacement and he soon found himself in a number of powerful ministerial offices.[5] There, Ensenada counterbalanced José de Carvajal y Lancaster in state matters. Carvajal had moved from his position on the Council of the Indies to replace Sebastián de la Cuadra as Secretary of State in 1746. In 1747 the Jesuit theologian Padre Francisco de Rávago became royal confessor and joined Ensenada and Carvajal at the apex of political power and royal influence. Together these three figures formed a ruling triumvirate that was Spanish in character and, more importantly for some, by blood.[6]

There were, naturally, differences between Ferdinand's two key ministers, Ensenada and Carvajal. While the former saw France as a reliable military and political ally and buffer against England, the latter favored diplomacy and exercised caution in light of British naval supremacy. Both recognized the slowly building conflict between the British and French as potentially benefiting Spain if it resulted in the return of Gibraltar and Minorca to Spain. Economically, Carvajal favored the development of industry on the peninsula, whereas Ensenada believed the greatest profit would be derived from monarchial involvement in the Indies trade. Sir Benjamin Keene (1697-

[5] José de Campillo became an important figure in later debates of state policy, notably relations between the peninsula and the Americas and the collection of taxes. His treatise, *New System of Government for America*, was published posthumously in 1789.

[6] For more on anti-French sentiment in early Bourbon Spain, see: José Manuel de Bernardo Ares, "Los embajadores franceses en España: Primeros ministros de la Monarquía hispánica (170-1709)," in *La proyección de la monarquía hispanica en Europa: política, guerra y diplomacia entre los siglos XVI y XVIII*, ed by. Rosario Porres Marijuán and Iñaki Reguera (Bilbao: Universidad del País Vasco, Servicio editorial = Eukal Herriko Unibertsitatea, Argitalpen Zertbitzua, 2009), 121-146; María Victoria López-Cordón Cortezo, "De monarquía a nación: la imagen histórica de España en el siglo de la Ilustración," *Norba. Revista de historia*, no. 19 (2006): 155.

1757), the British Ambassador to Spain, assessed the differences between the two ministers in a letter to Robert Darcy, 4th Earl of Holderness:

> One of them [Carvajal], at a time that there are scarce a subject to till their ground, has attempted even during the war, to establish manufactures of all sorts, and to furnish even the Indies with the products thereof, instead of what they now take from foreign nations. The other [Ensenada] despises these attempts (pretty justly) but runs into another extreme and instead of a manufacturer would [have] his Master [be] the sole banker and merchant in his country.[7]

Their disagreement, Keene concluded, could be manipulated to benefit British interests. France remained Britain's true threat, thus manipulating the dueling ministers into an internal debate could impede the growth of French influence at the Spanish court.

> [A]s long as these Ministers are rightly managed, the French will not prime it here, nor have it in their power to borrow aid from the name or wealth of Spain, which I hope will keep them from being too pert in their transactions in other parts of the world.[8]

Their personal competition for influence in the new government only compounded Carvajal's and Ensenada's divergent visions for Spain and its future course.

Despite the challenges created by the divergent policies of Ensenada and Carajal, the first eight years of Ferdinand VI's reign saw marked increased investment in state reform from the more tentative policies of his father, Philip V. While Philip had strengthened state authority, Ferdinand mobilized the state as an agent of change. In addition to increasing its military strength in anticipation of an impending British-French war, Spain also sought to close its widening gap in scientific and technological knowledge with northern Europe. To spur economic development, the government also centralized civil engineering and public works projects, seeking a uniform and united

[7] Keene to Holderness, 7 May 1753, British Library (BL), Add. MS 43, 429, f. 171 as transcribed in Lynch, *Bourbon Spain, 1700-1808*, 162.

[8] Keene to Newcastle, 13 August 1750, in Richard Lodge, ed., *The Private Correspondence of Sir Benjamin Keene, K.B.* (Cambridge University Press, 2015), 243.

civil infrastructure.[9] As we will see later in the chapter, these would be the focus of some of the reform efforts initiated by the marqués de la Ensenada. The foreign policy of Ensenada, while cautious, was undeniably pragmatic: appeasement of Britain to postpone conflict, withholding Spanish claims to Gibraltar until European conflict made the request tenable, and amicable relations with France as a means of bootstrapping Spanish civil infrastructure.

Ensenada's domestic policy was equally pragmatic: he believed that both the economy and government were sabotaged by an inefficient system based upon patronage and devolvement. Ensenada felt that the current system, rooted in independent regional authority and aristocratic rights, lacked proper oversight and served to distribute state resources inefficiently on the basis of patronage and not merit. The bold reforms initiated by Ensenada called for a rupture from Spain's past, creating a new, more efficient state system driven by empirical analysis and quantifiable data. All of these concerns exposed the need for new geographic measurements of the peninsula and the colonies to improve defense, agricultural production, taxation, and transportation. Thus, Ensenadean reform and geographic reform progressed hand-in-hand at mid-century.

Sinapia and the Ideology of Reform

We have few explicit and programmatic statements from Ensenada that give insight to the ideological foundations of his efforts to use science and technology to reformulate the Spanish state. Given this lack of explicit statements, we may ask: what

[9] Examples of state projects include: canalization in Castile, the Guadarrama road, and the Reinosa highway. See, e.g. Michael Crozier Shaw, "'El siglo de hazer caminos': Spanish Road Reforms During the Eighteenth Century. A survey and Assessment," *Dieciocho: Hispanic enlightenment* 32, no. 2 (2009): 413–434; John Thomas Wing, "Roots of eEmpire: state formation and the politics of timber access in early modern Spain, 1556--1759" (Ph.D. Dissertation, University of Minnesota, 2009).

sort of ideology might have motivated these reforms? Ensenada, and his peers, clearly sought commercial and military parity with their European neighbors. Moreover, though, they were attempting to reverse both the reality and the perception of Spanish decline by reorganizing the state according to principles of rationality and pragmatism. Such a change, they hoped, would yield utilitarian results that could fix the state's problems. Along with the pressing concerns that had propelled early geographic efforts under Philip V and Ferdinand VI – such as the weakened state following the War of the Spanish Succession, foreign encroachment on the American colonies, and the need for new natural resources to revive the stagnating Spanish economy – there was also a particular ambition underpinning the interest in geography among the Spanish governing elite. During the first few decades of the eighteenth century this ambition found its expression in the form of an idealism associated with a generation of Spaniards who came of age following the flourishing of the late-seventeenth century *novatores*, but for whom the return to the predominance of the Siglo de Oro had still not materialized. There is, of course, an inherent challenge in characterizing the parameters of the idealism manifested in any particular society. Historians are limited in their analysis to thoughts committed to the permanent record in some manner. Still, in the case of early eighteenth century Spain, it is possible to identify the prevalence of certain ideas among the intellectual elite. One entry point to the mentality of this social group is the Spanish utopian text *Descripción de la Sinapia, península en la Tierra Austral*.[10]

[10] I will refer to this manuscript hereafter simply as *Sinapia*. There are two editions of the manuscript, see: Miguel Avilés Fernández, ed., *Sinapia: Una utopía española del Siglo de las Luces*, Biblioteca de visionarios, heterodoxos y marginados 11 (Madrid: Editora Nacional, 1976); Stelio Cro, ed., *Descripcion de la Sinapia, peninsula en la tierra austral: A Classical Utopia of Spain* (Hamilton, Ont.: McMaster University, 1975). Stelio Cro discovered the manuscript of the Sinapia, but its authorship and dating were the subject of lively debate between Cro and Avilés. For analysis of their disagreement,

The *Sinapia* is a utopian novel constructed as an ironic inversion of Spanish society which was discovered as an unpublished manuscript in the Archive of Pedro Rodriguez, conde de Campomanes (1723-1802).[11] Campomanes, was president of the Council of Castile and a leading voice of reform in the Caroline period and it was among his personal papers that the original manuscript of the *Sinapia* was found. The marqués de la Ensenada, at mid-century, was guiding the reform that Campomanes would inherit by late-century. Reflecting on the caricature of specific challenges facing Spanish society in the *Sinapia*, we may better understand the ideology behind many elements of Ensenadean reform.

Although there has been some debate as to when the manuscript was written – with some scholars dating it to the late seventeenth century and others placing it in the eighteenth century – there is general consensus that the anonymous text shows the work of a Spanish intellectual grappling with the perceived difficulties of adapting modern philosophical thought to the unique Spanish situation.[12] While the *Sinapia* is clearly derivative of other European utopias – most notably those of Thomas More, Tommaso Campanella, and Francis Bacon[13] – it is grounded in its critical commentary on Spanish

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twenty-five years on, see José Santos Puerto, "La Sinapia: luces para buscar la utopía de la ilustración," *Bulletin Hispanique* 103, no. 2 (2001): 481–510.

[11] Pedro Rodriguez was a Spanish statesman, writer, and leading intellectual voice in the Caroline period. From 1788 to 1793 he was president of the council of Castile. The manuscript is located in the Archivo del Conde de Campomanes, Archivo de la Fundación Universitaria Española.

[12] The major contestations come from Cro and Avilés, with Cro attributing the work to an earlier, seventeenth century humanist and Avilés claiming it as a later product of the conde de Campomanes himself. José Santos Puerto has argued that the author was likely the Benedictine monk Martin Sarmiento, effectively splitting the chronological difference between Avilés and Cro. See: Avilés Fernández, ed., *Sinapia*; Cro, ed., *Descripcion de la Sinapia, peninsula en la tierra austral*; Santos Puerto, "La Sinapia."

[13] Thomas More, *Utopia*, trans by. Paul Turner, Reissued with new and updated editorial material. (London New York: Penguin Books, 2003); Tommaso 1568-1639 Campanella, *La città del sole: dialogo poetico = The City of the Sun: a poetical dialogue*, trans by. Daniel J. Donno (Berkeley: University of California Press, 1981); Francis Bacon, *New Atlantis and The Great Instauration*, ed by. Jerry Weinberger, Rev. ed. (Arlington Heights Ill.: H. Davidson, 1989). For more on eighteenth century Utopian thought, see Franco Venturi, *Utopia and Reform in the Enlightenment* (Cambridge: Cambridge University Press, 1971).

society. It is this unique Spanish condition that illuminates our present discussion. Foremost among these concerns was the lack of an institutional home for science and technology in Spain akin to the Académie des sciences in Paris or the Royal Society in London. Recall that early reform under Philip V had shifted the Casa de la Contratación from Seville to Cádiz, severely weakening its status as the center of Spanish geography.[14] As the burden of promoting scientific and technological innovation for practical ends was increasingly divorced from the mercantile home of the Spanish-American trade, neither the universities nor the military academies were yet fully prepared to take the reins of Spanish science.

The *Sinapia* is framed as an account of a civilization in the Tierra Austral drawn from the notes of a fictional employee of the Dutch East Indies Company, Abel Tasman. In this way, *Sinapia* is constructed to be the physical, geographic inverse of Spain.[15] Its name, Sinapia, is an anagram of the phonetic pronunciation of 'Hispania' and its society was meant to be an inversion of eighteenth-century Spain.[16] Of critical importance to the Sinapian society is their construction of a clear, logical, and, most importantly, rational legal system.[17] This most clearly demonstrates how the novel drew inspiration from the work of Thomas More in its construction of a utopian society by means of legal and institutional reform. Racial differences within the society are accounted for in the novel,

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[14] For the shift in colonial trade, see Kuethe and Andrien, *The Spanish Atlantic World in the Eighteenth Century*, 73–84. For the role of the Casa in Spanish scientific practice, see María M. Portuondo, "Cosmography at the Casa, Consejo, and Corte During the Century of Discovery," in *Science in the Spanish and Portuguese Empires, 1500-1800*, ed by. Daniela Bleichmar et al. (Stanford, Calif: Stanford University Press, 2009), 57–77.

[15] Consider, for example, this description of the island and its climate: "[the] peninsula is as that of Spain, but the seasons, the other way around, so that the longest day of the year is Christmas and the shortest is Saint John's Day." Avilés Fernández, ed., *Sinapia*, 72. I will reference page numbers from Avilés' edition, which also includes marginal notes to the original manuscript folio.

[16] Additionally, before the founding of Sinapia, the peninsula on which it exists was named Bireia, an anagram of Iberia.

[17] Avilés Fernández, ed., *Sinapia*, 113–116.

which depicts a society built from the blending of four ethnic groups: Tatars of China and Peru, Asian and European Persians, Zambales of Ethiopia, and Indians of Malay.[18] Unifying these disparate people, however, was Christianity.[19] Sinapia is a Christian nation, ruled jointly by the application of rational thought and Christian faith. Accordingly, the anonymous author states that "the vocation that the Sinapiense believe to be most palatable and worthy of man is the contemplation of God's greatness and then of his works."[20] Most interesting to this present argument, however, is the emphasis on popular education, medicine, and science in Sinapian society. This has led Stelio Cro to argue that *Sinapia* represents "a line of political thought original to its creator […] [that] the perfect state is a Christian state based on science and technology."[21] The writer of *Sinapia* argues that good citizens are created through a comprehensive education in the latest intellectual developments and that this in turn strengthened Sinapian society.[22] "Just as education depends on having good citizens and from this [comes] the conservation and health of the republic."[23]

There are three major institutes of higher learning in Sinapia: the ecclesiastical, the military, and the scientific seminaries.[24] In the first, students learn Hebrew and Greek as well as the rites, rituals, and sacred history of the Church. In the second, soldiers are taught artillery, fortification, and mechanics. In the last, "they teach all that relates to

[18] Ibid., 75.
[19] Ibid., 75; 93–94.
[20] Ibid., 124.
[21] Cro, ed., *Descripcion de la Sinapia, peninsula en la tierra austral*, 13.
[22] Avilés Fernández, ed., *Sinapia*, 116–119.
[23] Ibid., 116. "*Como de la educación pende el tener buenos ciudadanos y de esto la conservación y bien de la república, ponen en ello particular cuidado, siendo esto en lo que principalmente se esmeran los padres de familias y a lo que principalmente atienden los padres de barrio*."
[24] Ibid., 119.

Sinapia." All three institutes are paid for by public funds and are governed by the parents of the students.

The center of Sinapian society is the *Colegio*, characterized by the clearly defined scientific enterprise of its members, and it is this institute that most clearly demonstrates the influence of Francis Bacon's *New Atlantis* on the author.[25] While not an educational institution, like the three institutes described above, the *Colegio* is a center of research, experiment, and analysis. Science is linked to the *Colegio* in Sinapian society, and it is clear from this institute that science has played a key role in advancing their society.

> This *Colegio* has really been of great utility to the nation, because, by their means, every day they make advances in natural sciences to a point which will be difficult to believe in Europe, with very useful inventions for the conservation and alleviation of human life, closing the doors to the endless innovations and harmful inventions that could be spread by communication with foreigners, while, at the same time, acquiring […] an adequate knowledge of all the works of merit of the other nations – [such as describing] their history, and the state in which they were encountered – and, by means of the translations that are allowed with great prudence, enlightening their neighbors to that which should be [allowed] and what should be shielded from every thing that is harmful and useless, as are so abundant among us.[26]

The author highlights here two tensions of early-eighteenth century Spain: the perpetual competition of Spain with its European rivals and the potential of science for advancing Spanish interests in this competitive environment. Intellectuals in early-eighteenth-century Spain were all too familiar with the past achievements of Spanish sciences during

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[25] This is also evident from physical structure of the peninsula, see: Ibid., 32–35. The offices that individuals hold in the *Colegio*, found in sections 30 of the *Sinapia*, are Merchants of Light, Splitters, Pickers, Miners, Distillers, Benefactors, and Augmenters. Ibid., 124–127. The development of individual disciplines is found in section 31, "The Arts," Ibid., 127–130.

[26] Avilés Fernández, ed., *Sinapia*, 126–127. "*Este colegio ha sido verdaderamente de grandisima utilidad a la nación, pues adelantan cada dia (por su medio) la ciencia natural a un punto que sera dificil de creer en Europa, con invenciones utilisimas para la conservación y alivio de la vida humana, cerrando la puerta a infinitas novedades e invenciones dañosas que la comunicacion de los forasteros podia pegar, adquiriendo al mismo tiempo, con esta manera de peregrinación, puntual noticia de todas las obras de ingenio de las demas naciones, de su historia, del estado en que se hallan y, por medio de las traducciones que permiten con grande cautela, dan a sus vecinos toda la luz que conviene y la libran de todo lo dañoso e inutil, que tanto abunda entre nosotros*."

the reign of Philip II. In many ways, the state's reinvestment in natural philosophy during the reigns of Philip V and Ferdinand VI was an attempt to recapture that past glory.[27] Such efforts would also prove to be a prelude to later Caroline triumphs in natural philosophy and governance. The anonymous author also identifies another tension that would be seen in late-eighteenth-century Spanish science: the censorship of scientific works. "The books of foreigners are prohibited, if they are not translated into Sinapiense, by order of the Senate, which also prints with great care all the works that, by its own orders, the academics write."[28] Spanish geographers had to contend with censorship. For example, Tomás López, *Geógrafo real* – whom we will meet in the next chapter – had his own geographical publications reviewed and also harshly reviewed his peers' publications.[29] Jorge Juan, publishing his account of the royally mandated expedition to Quito, had to be careful not to offend the *censura*.[30] The Sinapian *Colegio*, however, was also promoting a different type of censorship. By prohibiting books that include "useless" knowledge, the *Colegio* attempted to protect its citizens from 'novelties,' or ideas and technologies lacking any utility that might be adopted enthusiastically by society. As we will see, this type of measured and pragmatic approach to the adoption of new methods or technologies was central to the Spanish geographic reform project, especially during the leadership of the marqués de la Ensenada.

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[27] This observation is echoed in: Manuel Casado Arboniés, "Bajo el signo de la militarización: las primeras expediciones científicas ilustradas a Suramérica (1735-1761)," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed by. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 23–24.

[28] Avilés Fernández, ed., *Sinapia*, 127.

[29] See, e.g. Archivo Histórico Nacional (AHN), Consejos de Castilla, Impresiones, Legajo 5537, Exp. 37; AHN, Consejos de Castilla, Impresiones, Legajo 5558, Exp.1, 3.

[30] Jorge Juan et al., *Observaciones astronomicas y phisicas hechas ... en los Reynos del Perú por D. Jorge Juan ... y D. Antonio de Ulloa ... de las quales se deduce la figura y magnitud de la Tierra y se aplica a la Navegacion* (En Madrid: por Juan de Zuñiga, 1748), prologo.

Another prominent tension in Spanish society addressed by *Sinapia* was centralization. While Sinapia is repeatedly described as an egalitarian society, the structure of power within its republic is unambiguously that of an absolutist monarchy. All power ultimately lies with the monarch, in whose person rest "the laws." The author uses the familial unit as a metaphor for the structure of society.[31] Thus, one might take the anonymous author to be suggesting a loving absolutist ruler as the utopian ideal.

> [A] Monarchial republic is the form [of Sinapean society], which is a mixture of aristocracy and democracy. The monarch is the law, the nobles are the rulers, and the village is [like] a family. [The republic's] figure is pyramidal, with the village at its base, the senate at its core, and the prince at its apex. The magistrates are [like] fathers of the family, fathers of the neighborhood, fathers of the village, fathers of the city, fathers of the province, senators, and the prince. Are all called PE, which means "father," in order to show that you should be affectionate, vigilant, and exemplary [at all times].[32]

Although Philip V had begun the processes of reversing longstanding regionalism, Spain remained divided both culturally and administratively. In creating a completely centralized urban society, the anonymous author suggests that contemporary Spain is the antithesis of this – grossly divided. Writing in the 1720s, Benito Jerónimo Feijóo (1676-1764) had noted as much in his *Teatro critico universal*:

> Love of the particular *Patria*, instead of being useful to the Republic, is in many ways damaging to it. For it creates some division in the spirits that should be mutually bound in order to make stronger and more constant the common society.[33]

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[31] The metaphor of the family unit for civil society may also be found in the work of John Locke, who refers to it as "conjugal society." See John Locke, *Two Treatises of Government*, ed by. Mark Goldie (London: J.M. Dent, 1993), 153-163.

[32] Avilés Fernández, ed., *Sinapia*, 86. "*Es la forma de esta república monárquica, mezclada de aristocrática y democrática. El monarca son las leyes, los nobles son los magistrados, y el pueblo son las familias. Su figura, piramidal, cuya base es el pueblo; el cuerpo es el magistrado y la cima es el príncipe. Los magistrados son padres de familia, padres de barrio, padres de villas, padres de ciudad, padres de provincia, senadores y príncipe. Todos se llaman PE, que quiere decir "padre", para mostrar que lo deben ser en el cariño, vigilancia y ejemplo*."

[33] Feijóo, Benito Jerónimo, *Teatro crítico universal, o discursos varios en todo genero de materias, para desengaño de errores comunes [….]* (Madrid: en la imprenta de Francisco del Hierro, 1729), vol. 3, 226. BNE, 2/58679 v3. "*Las divisiones particulares que se hacen de un dominio en varias provincias o partidos son muy materiales, para que por ellas se hayan de dividir los corazones. // El amor*

Regional alliances, the *amor de patria* Feijóo refers to, remained deeply rooted in the eighteenth century.[34] Ensenada saw the privileges historically granted to regional authority as empowering landed nobility the expense of the whole nation. Strengthening the nation, he believed, would require concentrating power in Madrid and reforming the systems of taxation and regional autonomy. The repeated cycles of revolt in Portugal, the Low Countries, and Catalonia, for example, illustrated to him the very real and divisive power regional identities had within Spanish civil society.

Setting aside the thorny issue of authorship, a close reading of *Sinapia* gives insight into the prevalence of certain ideas amongst Spanish intellectuals. While previous scholarship has documented widespread readership of utopian literature in Spain during the sixteenth and seventeenth centuries,[35] what separates the *Sinapia* in the eighteenth century is its focus on the unique Spanish situation. *Sinapia* was a prescriptive text, which advocated for popular education and described the salubrious benefits to the nation of promoting scientific enterprise. It was a call to action, yet it remained for Spanish society to invert its course, revive its failing scientific institutions, and regain its past prominence. Alexandra Merle has noted an attitude, prevalent among the Spanish elites,

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de la patria particular, en vez de ser útil a la república, le es por muchos capítulos nocivo. Ya porque induce alguna división en los ánimos que debieran estar recíprocamente unidos para hacer más firme y constante la sociedad común; ya porque es un incentivo de guerras civiles y de revueltas contra el soberano, siempre que, considerándose agraviada alguna provincia, juzgan los individuos de ella que es obligación superior a todos los demás respetos el desagravio de la patria ofendida; ya, en fin, porque es un gran estorbo a la recta administración de justicia en todo género de clases y ministerios."

[34] For eighteenth century perceptions of Spain and Spanishness, see Cortezo, "De monarquía a nación." See especially Cortezo's commentary on the how Spanish nobility took a position against French influence, but in support of the regional division of power in Spain: Ibid., 155. "En realidad, cada uno de ellos aspira a una ciudad utópica, de donde desaparezcan los residuos de la barbarie medieval fundidos en el crisol de un cultura superior, moldeada por el progreso y la tolerancia. Éste es el sueño del 'ilustrado' español del siglo XVIII, como los fue el de la humanidad superior en ese periodo," Jaime Vicens Vives, *Manual de historia económica de España* (Barcelona: Editorial Vicens-Vives, 1970), 431.

[35] See, e.g., Cro, ed., *Descripcion de la Sinapia, peninsula en la tierra austral*, v–vii; fn. 12.

which sought a balance between 'Utopia' and 'immobility.'[36] That is, progress through the reform of existing institutions and not through the abrupt rise of new ones.

If *Sinapia* indeed depicted the goal of state reforms, then it was also a prescriptive text offering clear directions to achieve such reform. It echoed concerns that resonated with Ensenada: the strength of a republic unified under centralized authority, the promotion of scientific enterprise by state institutions, and the competition between nations to gain practical knowledge. Yet, the first concern, creating a centralized and unified republic, would have to wait. Instead, Ensenada began his reform efforts by attempting to reverse the perception of Spanish scientific and technological inferiority through the emulation, appropriation, and, finally, assimilation of British and French geographic science into Spanish statecraft.

Ensenadean Reform: Foreign Education

The policies of state reform led by the marqués de la Ensenada to create a single, unified Spanish nation would be achieved, in part, by using science and technology.[37] Cartographic imagery and civil engineering projects, such as canalization and roadwork, would unify Spain geographically. Before state scientific projects aimed at unifying the Spanish nation could begin, however, it was necessary to construct an educational

[36] Alexandra Merle, "Société, noblesse et monarchie dance les 'Cartas marruecas'," in *Les Voies des Lumières: le monde ibérique au XVIIIe siècle*, ed by. Carlos Serrano, Jean-Paul Duviols, and Annie Molinié-Bertrand (Paris: Presses de l'Université de Paris-Sorbonne, 1998), 140. "Si sa conception de la société parfaite suggère un mélange d'utopie et d'immobilisme (c'est-à-dire le rêve de la perfection au sien des structures existantes), une telle attitude n'est guère surprenante dans l'Espagne du XVIIIe siècle, comme le montre l'étude de ce grand thème des individus."

[37] An overview of these issues may be found in José Luis Gómez Urdáñez, *El proyecto reformista de Ensenada* (Lleida [Spain]: Milenio, 1996), 236–262. Gómez labels the scientific and technical aspects of reform under Ensenada an "Enlightenment of practical knowledge" [*una Ilustración de saberes prácticos*]. While examining many of the same sources that are discussed in this chapter, Gómez argues for an interpretation of Ensenadean reform as derivative of British and French science.

infrastructure that produced civil servants capable of overseeing state science. Early in the eighteenth century José Patiño, Chief Minister and Secretary of the Navy, had begun the process of restoring Spain's naval resources. Ensenada continued Patiño's project, expanding the effort by focusing the reform of scientific and technical education at the military academies. Ensenada also addressed the embarrassing lack of an accurate atlas of Spain, organizing an atlas project and sending promising young geographers to receive technical education abroad. While these efforts were not completed before his dismissal from office, Ensenada had reformed the institutions where modern geography would gain a permanent home.

The scientific and technical education of Spaniards abroad during the Bourbon monarchy is a large and unwieldy subject deserving of far more space than it will be allotted by this dissertation.[38] In any such discussion, the motivations of both Spaniards and the Spanish government ought to be compared and contrasted, showing that both personal and national ambitions motivated the decision to acquire technical and scientific knowledge under foreign state systems. This section will focus specifically on two individuals sent to study geography in France during the middle of the eighteenth century: Juan de la Cruz Cano and Tomás López. They were sent to Paris by the marqués de la Ensenada to gain expertise in geographic science, and are exemplars of the ambitions, hopes, and aspirations of the reform movement. They would return to Madrid and serve as *Geógrafos reales* (Royal Geographers) through the end of the Caroline period.

[38] This is, perhaps, the next topic of study in the history early modern Spanish science in need of serious focus. A preliminary entry in this topic regarding engraving and cartography may be found in: Antonio Crespo Sanz, "La imprenta y las técnicas de grabado como elemento de difusión de los mapas," in *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*, ed by. Mariano Cuesta Domingo and Alfredo Surroca Carrascosa (Madrid: Ministerio de Defensa, 2010), 361–373.

Cruz Cano and López were not the first pair of bright, young Spanish scholars sent abroad for such a purpose during the Bourbon period. They followed in the footsteps of Antonio de Ulloa (1716-1795) and Jorge Juan (1713-1773). Ulloa and Juan, as we know, served as Spanish representatives during the French-Spanish Geodetic Mission to Quito in 1735.[39] Upon their return to Spain, their scientific notes were edited and published, while their secret, political notes on the American colonies were circulated quietly among government ministers.[40] Soon after their return from the 1735 expedition, Juan and Ulloa were themselves sent abroad at mid-century in hopes of growing both Spanish naval power and scientific prestige – Juan traveling to London and Ulloa to Paris.

By mid-century, the naval restructuring efforts initiated by José Patiño had waned. However, owing to the ever-present threat of armed conflict between the British and the French – that would, invariably, force a Spanish response – there remained a pressing need for able naval vessels. Ensenada believed that a strong naval force was vital to defensive policy and served as a sign of Spanish strength. The expectation that France and Britain would not seek to engage Spain militarily, but rather use Spain as an ally against the other informed the character of naval expansion. While the army maintained its outdated policies of fixed fortification with set battalions, Ensenada focused on naval development to bolster Spanish presence on the international geo-political stage. The Spanish fleet was the first asset to feel renewed investment at the

[39] For more on their contributions to this mission, see Chapter One, pp. 66-70.

[40] Scholars, most notably Lafuente and Peset, identify the scientific and political dual nature of Juan's and Ulloa's mission as establishing a new style of governance in Spain. Indeed, it is my contention that such a style of governance was promoted by the marqués de la Ensenada and was built on the use of geographic science to guide political reform. See: Antonio Lafuente and José Luis Peset, "Política científica y espionaje industrial en los viajes de Jorge Juan y Antonio de Ulloa (1748-1751)," *Melanges de la Casa de Velázquez* 17 (1981): 233.

shipyards of Cádiz, Ferrol, and Cartagena. In the Americas, the shipyard in Havana enjoyed a steady supply of timber from the Caribbean and money from Mexico. In the period between the end of the War of Jenkins' Ear in 1748 and 1795, Spanish naval power grew from twelve ships to two hundred. The rapid construction of ships was matched by growth of the officer corps and recruitment of able seamen.

Ensenada recommitted Spain to Patiño's policies and pushed for increased ship production. He worked to find available timber and metal resources, importing Baltic timber as well as wood from the colonies, as needed. While the previous half century tended to favor construction of faster ships in the French style, Ensenada soon began a campaign to recruit English ship builders to construct ships of the British style that favored firepower over maneuverability.[41] From 1749-1750, Jorge Juan was dispatched to England with two naval cadets for a visit to the Royal Society. His real mission, however, was to complete a clandestine study of British naval activity.[42] Juan was instructed to indicate that his trip had "no other object than to deal with individuals of the Royal Society on points of mathematics," while the two naval officers who accompanied him were there to acquire "the books and instruments most needed" for teaching modern mathematics.[43] Juan was also told to move "with as much skill and secrecy as possible" to learn about British naval craftsmen, and, if the opportunity arose, to seduce "one or two of these craftsmen [*constructores*] to come to Madrid, to aid in the construction of

[41] For a history of ship design, see Larrie D. Ferreiro, *Ships and Science: the birth of naval architecture in the scientific revolution, 1600-1800* (Cambridge, Mass.: MIT Press, 2007).

[42] Juan was a corresponding member of a number of European scientific societies. Some of Juan's notes from his trip to London may be found in Jorge Juan, "Principle Dimensions Proper for a ship of each class in the Royal Navy prepared by his magesty's [sic] builders, according to the Dimensions resolved on by the King's Orders" (Madrid, 1752), AMN ms. 0420, Archivo Museo Naval.

[43] *Instrucción reservada de lo que de orden del rey ha de observar el Capitán de Navío D. Jorge Juan [...]* AMN ms. 2162, f. 2-4. Transcribed in Lafuente and Peset, "Política científica y espionaje industrial en los viajes de Jorge Juan y Antonio de Ulloa (1748-1751)," 249–252.

ships for [the King of Spain] in [Spanish] arsenals." In London, Juan quickly became aware that as a foreigner, his access to shipyards or other centers of technical education and skilled labor production would be limited. While Juan was permitted virtually unrestricted access to the philosophical aspects of his mathematical tourism, debating theories of astronomical observation and reporting on the geodetic results of the 1735 expedition at the Royal Society, his presence in the midst of England's growing industrial zone, by contrast, caused some alarm. Exchanging letters with Ensenada through diplomatic channels, he was ordered nonetheless to continue on his ambitious tour of European industrial centers for the purpose of scientific and technical espionage.[44]

At the same time, Antonio de Ulloa traveled to France with the declared purpose of studying mathematics. Ulloa's real mission, however, was to entice French naval artisans and craftsman into Spanish service.[45] The official focus of the trip was the *Académie des sciences*, where Ulloa was a corresponding member, but in his secret instructions to Ulloa, Ensenada had specifically charged Ulloa to pay particular attention to the ambitious Cassini project to map France.[46] Ulloa's mission began with a brief study of Barcelona's port, before moving on to the famous Toulon arsenal and shipyard. Next, Ulloa was instructed to stop in Languedoc to study canals, then on to Brest,

[44] The bulk of these documents were shuffled through the embassy in Lisbon, see Archivo General de Simancas (AGS), Estado, leg. 7228. For more on this aspect of Juan's life, see Gómez Urdáñez, *El proyecto reformista de Ensenada*, 248–249; Lafuente and Peset, "Política científica y espionaje industrial en los viajes de Jorge Juan y Antonio de Ulloa (1748-1751)."

[45] Ulloa continued to influence Ensenada, petitioning him to construct an astronomical observatory, and improve canalization in Castile. See Ulloa's letter to Enenada, as transcribed by Antonio Rodriguez Villa in Villa, *Don Cenon de Somodevilla, marqués de la Ensenada*, 357–360.

[46] *Instrucción reservada de lo que de orden del rey ha de observar el Capitán de Navío D. Antonio de Ulloa […]* AGS, Marina, 712. Transcribed in Lafuente and Peset, "Política científica y espionaje industrial en los viajes de Jorge Juan y Antonio de Ulloa (1748-1751)," 252–260. The geographic focus of Ulloa's trip to France is repeatedly explored by Lafuente and Peset, see, e.g., Ibid., 242–244.

Rochefort, and Lyon. Finally, Ulloa was to arrive in Paris and the Académie. As Ensenada explained:

> By the order of Mr. Colbert there has been established in Paris an Academy for the French Nation, whose political providence has given France the primacy its citizens [*naturales*] enjoy in invention and design, with utility to industry and commerce, and which could, in part, supply to our Spain such skilled laborers [*hombres de esta habilidad*] that are greatly lacking; Antonio de Ulloa will study [this] and shall manage by means of his skills, prudence, and luck to seduce to come to Spain one or several masters or officials skilled in design at whatever price in Lyon or Paris, who will be paid religiously whatever they were contracted for.[47]

Ensenada perceived the Académie as the engine of national development. Not because it was a beacon of modern natural philosophy, but instead because it was a place where the pursuit of practical knowledge had benefited French commerce and industry. After stops in Bayonne, Nantes, L'Orient, and Bordeaux, Ulloa was expected to, "try to gather secret maps of all of the colonies and fortifications which France has in the Americas and the Indies, and information regarding the illicit trade which [French] ships conduct in our America, and how the ministry disguises, sustains or prohibits the practice."[48] After completing his mission in Paris, Ulloa undertook a brief tour of Europe visiting Denmark, Prussia, Sweden, and Russia to ascertain their level of technical advancement.

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[47] *Instrucción reservada de lo que de orden del rey ha de observar el Capitán de Navío D. Antonio de Ulloa […]* AGS, Marina, 712. Transcribed in Lafuente and Peset, "Política científica y espionaje industrial en los viajes de Jorge Juan y Antonio de Ulloa (1748-1751)," 254–255. "*Por disposición de Mr. Colbert se estableció en Paris una Academia para la Nación Francesa, a cuya providencia política debe la Francia la primacía que gozan sus naturales en la invención y dibujo, con utilidad de sus manufacturas y comercio, y a fin de que en nuestra España pueda suplirse en parte la grande falta que tenemos de hombres de esta habilidad; estudiará D. Antonio de Ulloa y pondrá en práctica los medios que su maña, prudencia y las ocasiones le facilitaren para ganar a cualquiera precio en León o en Paris alguno o algunos Maestros y Oficiales sobresalientes en el dibujo, que vengan a España, a los cuales se mantendrá religiosamente lo que contrataren*."

[48] *Instrucción reservada de lo que de orden del rey ha de observar el Capitán de Navío D. Antonio de Ulloa […]* AGS, Marina, 712. Transcribed in Ibid., 255. "*Procurará recoger planos secretos de todas las colonias y fortificaciones que tiene la Francia en la América y en las lndias, y se informará del comercio ilicito que también hacen sus navios en nuestra América, cómo le practican si la disimula, sostiene o prohibe el Ministre*."

By 1750, the marqués de la Ensenada had implemented a number of naval reforms, having grown the fleet, supplied both financial and natural resources to continue ship production, and by directing the introduction of new technological expertise to Spanish shipyards. In addition to the efforts of Ulloa and Juan to improve Spanish technical knowledge through the acquisition of books and instruments and espionage, the immigration of skilled foreigners remained crucial to beginning the reform process. Among the notable figures brought to Spain were naval architects such as Briant, Tournell, and Southell, Arabic scholar Miguel Casiri, Luis Godin, who became director of the Naval Academy in Cádiz, the geographer Guillermo Bowle, and the natural historian Josef Quer.[49] These recruitment efforts extended beyond the science of geography, and also included experts in botany, Arabic philology, legal thought, medicine, and naval architecture and extended also to the realm of civil engineering, as we will see below.[50]

The marqués de la Ensenada remained keenly aware, however, that the reforms could not be based entirely on the recruitment of scientists and skilled technicians abroad. Rather, he hoped that such foreign nationals would help to train Spaniards in their crafts and start a period of rapid modernization.[51] Ensenada remained brutally critical of the absence of academies in Spain to nurture scientific enterprise and provide an institutional setting for those foreigners employed educating Spaniards:

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[49] Ensenada's earliest biographers note these figures, among others. For more, see: Villa, *Don Cenon de Somodevilla, marqués de la Ensenada*, 144.

[50] A complete estimation of the scope of the immigration policy has not been made. Just counting naval artisans who came as a result of Jorge Juan's trip to London, Merino Navarros claims that more than fifty Englishmen, along with their wives and children, emigrated to port cities such as Ferrol, Cartagena, and Cádiz, see Gómez Urdáñez, *El proyecto reformista de Ensenada*, 246, fn 214.

[51] Such a sentiment is expressed in epistolary exchange between Agustín de Ordeñana and Luis Ferrari, to which Ensenada and Antonio de Ulloa also make comments. The letters are transcribed in Rodriguez Villa, as Document 40: Villa, *Don Cenon de Somodevilla, marqués de la Ensenada*, 365–368.

> It remains to erect [Academies] for the improvement of arts and sciences in Madrid and in the provincial capitals. All of the Princes of Europe have established [such academies], and they are only lacking in Spain, to the dishonor of the Nation.[52]

As Ensenada contemplated the scientific production of the Royal Society in London, the Académie des sciences in Paris, and burgeoning academies in Berlin, Saint Petersburg, and beyond, nothing surpassed his admiration for the geographic products coming from France. Ensenada understood that geographic knowledge of the peninsula would be crucial to any plan for national reform. France offered proof of this conviction, and Ensenada was particularly impressed by the Cassini mapping project and its impact on French monarchial administration.[53] "In France," he wrote, "they work continuously to perfect their own [geographic knowledge], measuring once and again [*uno y muchas veces*] the lands, in which they have made great progress, directed in these operations by the famous Cassini the Younger."[54] To replicate the effort in Spain, Ensenada orchestrated a three-tiered geographic mission: first, Jorge Juan would create a plan for the triangulation of the peninsula with the goal of creating an authoritative "scientific map" of Spain, second, two Jesuits priests would simultaneously work on a less rigorous map of Spain, and third, two young Spaniards, Tomás López and Juan de la Cruz Cano, would go to Paris to study geography. Ensenada's ambitions were eloquently and bluntly stated in his *Puntos de gobierno*:

> The benefit that will be produced by this plan is not solely the knowledge of the actual location of each place; [moreover,] it will show the extent of our territory,

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[52] Él marqués de la Ensenada, *Puntos de gobierno*. Transcribed in Ibid., 161. "*Se habian de erigir para el aprovechamiento de las buenas letras y ciencias en Madrid y en las capitales de provincias. Las han establecido todos los Príncipes de Europa, y solo faltan en España, con descrédito de la Nación*."

[53] A brief summary of this project was given in Chapter One, pp. 28-31.

[54] Él marqués de la Ensenada, *Puntos de gobierno*. Transcribed in Villa, *Don Cenon de Somodevilla, marqués de la Ensenada*, 162. "*En Francia trabajan continuamente en perfeccionar las suyas, midiendo una y muchas veces los terrenos, en que han adelantado mucho, dirigiendo estas operaciones el famoso Casini joven*."

> the certain limits of each province and the responsibility [*comprehension*] of each official, the course of the rivers, the terminus that they reach, and the navigability of them, the use and improvement of the lands, with the crops that each may produce, the Royal and rural roads, and other topics pertinent to the good government of the Monarchy and to the growth of commerce. We will know the true measurement of Spain (*cuántos pies mide la España*) and each of its provinces, the harvest that each may give, the aid and assistance that one may receive from the other, and in which places are more suitable [*proporción*] than others for the establishment of certain [types of] factories, which is a delicate business.[55]

Geographic science was not only a means of delineating the terrain and representing the current state of Spain's political and economic reality. Rather, Ensenada saw geographic data as prescriptive for the future direction of the monarchy. Astute analysis of the data could be used to quell regional unrest and guide economic rejuvenation.

López and Cruz Cano were not chosen at random for this assignment, but, rather, had been slowly groomed by successive ministers, sent to study mathematics and art under the premier academicians within Spain. From 1749-1750, for example, Tomás López spent his mornings studying mathematics at the Colegio Imperial under Padre Joannes Wendlingen, a Jesuit mathematician and astronomer, at the direction of the marqués de Villarias, the minister of State, Grace, and Justice.[56] The Jesuit father also instructed his young pupil in rhetoric and grammar, completing López's education according to Jesuit curricular standards. In the afternoons, López was sent to the Royal

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[55] Él marqués de la Ensenada, *Puntos de gobierno*. Transcribed in Ibid. "*El beneficio que producirá esta providencia no para en el conocimiento de la situación puntual de cada lugar; pondrá á la vista la extensión de su territorio, los límites ciertos de cada provincia y la comprehension de cada corregimiento, el curso de los rios, los términos que pueden regar, y la navegación que puede hacerse en ellos, el uso y aprovechamiento de las tierras, con los frutos que pueden producir, los caminos Reales y particulares, y otras noticias importantes al buen gobierno de la Monarquía y al adelantamiento del comercio. Se sabrá cuántos pies mide la España y cada una de sus provincias, las cosechas que pueden dar, el auxilio y asistencia que puede sacar una de otra, y en qué parajes hay más proporción que en otros para establecer ciertas fábricas, que es uno de los puntos más delicados que pueden ocurrir.*" Urdáñez briefly discusses the effect of the Industrial Revolution on Enseanda and his pursuit of practical knowledge, Gómez Urdáñez, *El proyecto reformista de Ensenada*, 245.

[56] For an account of López's early life, see Antonio López Gómez, *Cartografía del siglo XVIII: Tomás López en la Real Academia de la Historia* (Madrid: Real Academia de la Historia, Departamento de Cartografía y Artes Gráficas, 2006), 101–102.

Bakery (*Panadería Real*) where the Royal Sculptor, Giovanni Domenico Olivieri, taught him to draw.

In 1752, López and Cruz Cano spent six months assisting Jorge Juan and Antonio de Ulloa first to complete a survey of the Royal Forest in Viñuelas and then to draft a topographical map of the area.[57] Juan and Ulloa, recently returned from their travels devoted to technical espionage, had collaborated on a plan for the realization of a comprehensive triangulation survey of the Iberian Peninsula, which had been presented to the marqués de la Ensenada. While never explicitly acknowledged, this six-month forest survey would appear to have been a final test – a field test of sorts – for López and Cruz Cano before they were sent abroad as royal pensioners to receive expert technical education.

If the forest survey was a test, then López and Cruz Cano performed satisfactorily. Later that same year, the marqués de la Ensenada sent them to Paris to acquire the expertise needed to fulfill the goal of carrying out a modern triangulation survey of Spain.[58] López and Cruz Cano were accompanied to Paris by two apprentice engravers, Manuel Salvador and Alonso Cruzado – also pensioners – highlighting the technical as well as scientific goals of the mission.[59] Surprisingly, however, few details about these individuals' motivations or specific details about their activities during this period survive in the historical record. In his application for formal admission to the

[57] 21 November 1776, Memorial. Real Academia de Historia (RAH), Archivo Secretaría, Expediente de Tomás López.

[58] Ensenada notes in his *Puntos de gobierno* that within the French Court, Nheuland "has offered to have two [students] in house for 1,500 *librars* per annum each."

[59] See, especially, Antonio Crespo Sanz on the technical skills of engraving: Crespo Sanz, "La imprenta y las técnicas de grabado como elemento de difusión de los mapas," 371–373.

Royal Academy of History, some sixteen years after returning to Madrid, López offers scant details about this formative period:

> In this same year of 1752, I was named by His Majesty [*S.M.*] to receive instruction in geographic science in Paris and Amsterdam. In the course of the nine years that I was in Paris, I took two complete mathematics courses with the Abbé de la Caille at the Collége Mazarín. I [also] attended his private lessons, the astronomical lessons of Mr. Lalande and those of Mr. Le Monnier and others.[60]

Throughout this period, the reason the marqués de la Ensenada had sent him to Paris, as López noted in a letter of thanks to Mariano Luis de Urquijo, remained constant: "to study Geography and to map Spain, according to the proposition which Jorge Juan and Antonio de Ulloa had made."[61] Although Juan de la Cruz Cano does not appear to have left any record of his activities during this period, it may be assumed that he and López had similar, if not identical, experiences.

The private lessons that López describes above conform perfectly to the marqués de la Ensenada's vision for Spanish reform that emulated the achievements of French state science. The Abbé Nicolas Louis de la Caille, Jérôme Lalande, and Pierre Charles Le Monnier represent three of the most esteemed French astronomers of their generation.[62] Their contributions to astronomy, in particular, emphasize the goal of an

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[60] 21 November 1776, Memorial. Real Academia de Historia (RAH), Archivo Secretaría, Expediente de Tomás López. "*En el mismo año de 1752 fue nombrado por S.M. para hir a instruirse en la ciencia geográfica a París y Ámsterdam. En el discurso de nueve años que estubo en París, hizo dos cursos de Matemáticas completos con el abate de la Caille en el Colegio de Mazarín. Asistió a sus lecciones privadas, a las de Astronomía de M.r La Lande y a las de M.r le Monnier y otras. Hizo lo posible para desempeñar su obligación y el buen concepto de su nacíon en estas escuelas públicas, donde concurrían alumnos de todas las naciones*."

[61] Tómas López to Mariano Luis de Urquijo, Archivo Historico Nacional (AHN), Estado, L. 2923, caja 1.

[62] For biographical details, see Owen Gingerich, "Lacaille, Nicolas-Louis De," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008), Vol. 7, 542-545; Thomas Hankins, "Lalande, Joseph-Jérôme Lefrançais De," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008), Vol. 7, 579-582; Thomas Hankins, "Le Monnier, Pierre-Charles," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008), Vol. 8, 178-180. The astronomical writings of La Caille, in particular, would form the basis of the scientific education at the Academy of Naval Cadets in Cádiz.

observationally based, scientific geography of Spain. Similarly, the Collège Mazarin represents a particular success of the French model of state science that Ensenada hoped to emulate.[63] Founded as part of the bequest of the personal library of Cardinal Mazarin in the mid-seventeenth century, the Collège became one of the historic colleges of the University of Paris; among its notable graduates are Jean d'Alembert, Antoine-Laurent Lavoisier, and Jean-Baptiste d'Anville. Renowned both for its architecture and as a center of higher learning, the Collège Mazarin easily lends itself to comparison with the *Colegio* of Sinapia. At both, the best and brightest received formal instruction that prepared them for service to the state.

While Ensenada's goal had to have been to raise two Spanish Cassinis, in Paris López and Cruz Cano found themselves, foremost, in the workshop of Jean Baptiste d'Anville.[64] There López states that he "performed my duty" under the French geographer "to the delight" of the Spanish Ambassador, Jayme Masones de Lima.[65] During this time, López and Cruz Cano also formed some sort of professional association with Guillaume Nicolás Delahaye, another prominent geographer and engraver who worked under d'Anville.[66]

Among the most prominent geographers in France, the historical methodology found in d'Anville's geography differed significantly from the scientific and

[63] This institution was also known as Collège des Quatre-Nations. For more on the Collége, see Jean-Pierre Babelon, "Louis Le Vau au collège Mazarin : Rome à Paris?," Communication à l'Académie des Beaux-Arts, 25 April 2001, [electronic publication], 2001, 17 pp.

[64] It is startling to find that there are no comprehensive biographies of Jean Baptiste Bourguignon d'Anville, for brief overviews see: Lucile Haguet, "J.-B. d'Anville as Armchair Mapmaker: The Impact of Production Contexts on His Work," *Imago Mundi* 63, no. 1 (January 2011): 88–105; Juliette Taton, "Anville, Jean-Baptiste Bourguignon D'," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008), Vol. 1, 175-176.

[65] Tómas López to Mariano Luis de Urquijo, Archivo Historico Nacional (AHN), Estado, L. 2923, caja 1.

[66] 21 November 1776, Memorial. Real Academia de Historia (RAH), Archivo Secretaría, Expediente de Tomás López. Frustratingly, López never mentions whom he met while in Amsterdam. Cruz Cano does not appear to have left any mention of this formative education, at all.

observational precision characteristic of the Cassini family's approach. Anne Godlewska expertly explores the tensions emerging in eighteenth century French geography between the historical and scientific methods:

> In this period, there were two major methods of solving geographic problems. According to the first, instruments and human error being what they were, critical comparison of many sorts of sources was deemed necessary to produce an adequate map. The second method held that the essence of good geography was rigorous field observations and oft-repeated field measurement. D'Anville had been a master at the first method and the large scale geographers – the *ingénieurs-géographers, arpenteurs, ingénieurs des ponts et chaussées, ingénieurs militaires*, etc. – had been the main practitioners of the latter.[67]

D'Anville's methodology, then, was based on the accumulation of all previously published maps of a region, which he then meticulously studied and compared with travel accounts. Perceiving geography as more of a philological exercise than a mathematical science, d'Anville was a master linguist and voracious reader. Describing his map collection, d'Anville wrote that:

> If the wish to have only a Geography imprinted in some way by the locality can be no more than a chimera, is it not proper to attempt to procure as much as can be supplied to some degree of perfection? A quite special devotion, sixty years of application to this study, has given me the advantage of taking a few steps towards this perfection. In assembling nine to ten thousand Map sheets, of which more than five hundred are manuscripts, this amount of material was fully appropriate to give Geographical works, whether written or worked into Maps, greater precision, and to lavish a greater richness, if I may put it thus, than has hitherto been known on the subjects with which I have been occupied.[68]

Once he had collected all possible information, d'Anville sketched each piece of the maps according to his notes. Regions or locations about which no definitive conclusions could be drawn were left blank, with citations to source material placed on the sketch as

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[67] Anne Godlewska, "Traditions, Crisis, and New Paradigms in the Rise of the Modern French Discipline of Geography 1760--1850," *Annals of the Association of American Geographers* 79, no. 2 (June 1989): 200.

[68] Jean Baptiste d'Anville, *Considérations générales sur l'étude et les connoissances que demande la composition des ouvrages de géographie* (Paris, Lambert, 1777), 5–6. As quoted in Haguet, "J.-B. d'Anville as Armchair Mapmaker," 92.

needed. These varied sketches were then sent to the engraver to be combined into a single uniform geographic vision. D'Anville divided his workshop into two distinct parts, each devoted to half of the geographic process: the historical (geographic) research that informed the maps contents and the artistic (cartographic) engraving that ensured sufficient profit to fund his costly map collection.

The contrast between these two styles of geographic practice, one based on direct observation and the other based on historical records or verbal testimony, persisted from the seventeenth century through the early-nineteenth century. Explaining the Baconian division of the science, Richard Yeo describes the partitioning of intellectual inquiry into three distinct faculties (history, poetry, and philosophy), where geography was classified as a historical genre.[69] D'Anville's geographic practice was based upon memory and description, not on direct observation and measurement.[70] In contrast, scientific cartography was based on repeated field observation and quantification. It had the hallmarks of Baconian science. This reformed natural philosophy, the home of astronomy and mixed mathematics, was driven by an observational and experiential epistemology that defines the geographic vision of the Cassini mapping project. Thus, ironically, even before they had even begun their education, López and Cruz Cano had diverged from Ensenada's sweeping vision for a reform movement that would rebuild the state apparatus anew on a thoroughly empirical foundation.

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[69] Richard Yeo, "Classifying the Sciences," in *The Cambridge History of Science*, ed by. Roy Porter (Cambridge: Cambridge University Press, 2003), 253. "History included natural history, geography, and political, ecclesiastical, and civil history, as well as the mechanical arts and crafts. Poetry covered the written and visual works of imagination, such as drama, painting, music, and sculpture. Philosophy, the largest group, contained 'all arts and sciences,' or, in Bacon's words, 'whatever has been from the occurrence of individual objects collected and digested by the mind into general notions.'"

[70] For historical dictionaries, see Ibid., 251–252. Yeo highlights Bacon's distinction between natural philosophy and natural history on remarkably similar grounds, see Ibid., 254.

As we will see in Chapter Four, both López and Cruz Cano went on to become prolific cartographers. If the goal for Ensenada had been mathematically and astronomically precise maps that might aid in governmental reform, however, the skills that these individuals brought back (or chose to practice) fell short of that ambition. While their education in engraving led them to create lush, detailed maps of Spain and her colonies, those details failed to reflect the reality of conditions on the ground. That is, these cabinet geographers' reluctance to perform field observations that might reflect their own technical errors or cultural biases prevented them from producing cartographic evidence that could inform a philosophy of governance based upon repeated and evolving analysis of conditions on the ground. The cabinet geography methodology that López and Cruz Cano learned from d'Anville was fundamentally at odds with Ensenada's vision for reforming Spain. Indeed, a new, reformed nation could never be guided by maps based on historical visions of its past instead of observational evidence of its present condition.

Ensenadean Reform: Domestic Projects

Under the marqués de la Ensenada, the role of geographic science in state reform was not limited to cartographic projects. He also pursued a policy that entirely re-envisioned the geography of the Spanish monarchy. The effort to cartographically reconceptualize the space corresponding to the Spanish monarchy was described in the previous section, here two other manifestations of geographic sciences will be described: demography and economics.

The pragmatic domestic policy of Ensenada was driven by the firm belief that both the economy and governance were sabotaged by an inefficient system based upon

patronage and devolvement. Describing the Royal Treasury (*Real Hacienda*), Ensenada wrote, "it is composed of several branches, seeming that most of them have been invented by the enemies of happiness of this monarchy."[71] Equity would be found, Ensenada believed, in reducing the complexity of the Spanish Treasury's revenue collection to a single tax (*la unica contribución*), whose profits would fund investment in naval power. Thus, as Secretary of the Treasury, on 10 October 1749, Ensenada put forward a plan to reduce the multiple taxes on consumer goods and services to a single tax based upon income. In order to test its feasibility, Ensenada also commissioned a national survey (*catastro*) of population, property, and income.[72] The Ensenadean *Catastro* was one of three cadastral surveys conducted in the eighteenth century, but it was the largest and most detailed of all these.[73] Unlike previous regional efforts, Ensenada directed that his survey use the same metrics to measure the size of populations, properties, and agricultural yields throughout the Crown of Castilla y León.[74]

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[71] Marqués de la Ensenada, *Segunda Parte de Hacienda*, as quoted in Villa, *Don Cenon de Somodevilla, marqués de la Ensenada*, 50. "Compónese ésta de varios ramos, pareciendo que los más de ellos han sido inventados por los enemigos de la felicidad de esta Monarquía; pues contribuyendo á proporción mucho menos el rico que el pobre, éste se halla en la última miseria, y destruidas nuestras fábricas, que han servido de pauta á las que florecen en otros reinos , así porque en España se llegaron á perfeccionar primero, como porque de ella sale la principal materia con que las ceban y engrandecen; porque, Señor, de todo cuanto hay en Europa, hay en España en sazón y perfección, y en España sola hay muchas cosas que no hay en Europa."

[72] As will be made clear in the section that follows, Ensenada's goal was to emulate the better-known cadastral efforts of early modern England and France, both methodologically and in pursuit of the same ends.

[73] The other eighteenth century cadastral surveys were those of Patiño in Catalonia (1715-1716), and in Madrid (1749-1752). While the other two surveys led to the successful reform of taxation structures, the Ensenada survey did not lead to successful taxation reform.

[74] The *Catastro* covered all of peninsular Spain, except The Basque Country, Navarre, and the Crown of Aragón. The Balearic Isles were excluded since they were part of Aragón, while the Canary Islands were excluded since they had an independent taxation system. Concepción Camarero Bullón, "El Catastro de Ensenada, 1749-1759: diez años de intenso trabajo y 80.000 volúmenes manuscritos," *CT/Catastro* 46 (December 2002): 61–88.

The stated motivation to conduct the survey may have been the single tax scheme, but the *Catastro* was no less motivated by the reforming ethos of centralization and public happiness. The terminology of *catastro* implied that the quantification of territory, resources, and property values would be conducted by traveling officials employed by the central government, unlike an *amillaramiento* that was based on data reported to a central body by local officials.[75] Ensenada attempted to justify the costly and challenging prospect of a survey effort at the national level by making reference to other successful efforts and by the potential benefit to the state.

> The project of a cadastral survey (*catastro*) of Castile [will be] neither short nor easy, if it is conducted as it has been in France, Savoy, and in part of Italy, where I have seen the effects that are described here, but it is not impossible nor costly to the public, once there are capable *intendentes* and accountants – which some are known, and those that are missing will be made with practice – and the Royal Treasury ought to pay the salaries of these officials and their subordinates, because if the towns are taxed at the time of the investigations of the *haciendas*, it would create very ill-will against the survey, whose utility will not be understood until [after] the single tax is established.[76]

Thus, once again, Ensenada modeled his reform program on the example of Colbertian French state science. He similarly noted here recent efforts in Naples, under the future Charles III of Spain, to reform the state apparatus.[77] Based on his observations of other nations in Europe, Ensenada argued that quantifying the countryside through such a cadastral survey would provide the central government the necessary data to revitalize the

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[75] For this distinction, see Ibid., 75. For a reflection on the meaning of *catastro* as the "statistical census" versus a "royal tax," see Ibid., 61.

[76] Marqués de la Ensenada, *Segunda Parte de Hacienda*, as quoted in Villa, *Don Cenon de Somodevilla, marqués de la Ensenada*, 52. "*La obra de catastrar las Castillas, ni es breve ni la más fácil, haciéndose como en Francia, Saboya y parte de Italia, donde yo he visto los efectos que aquí se afirman, pero no es imposible ni costosa al público, una vez que haya intendentes y contadores hábiles, de que se conocen algunos, y los que falten se harán con la práctica, debiendo costear la Real Hacienda los sueldos de estos ministros y los salarios de sus subalternos, porque si se gravasen los pueblos con ellos al tiempo de hacer las averiguaciones de las haciendas, entrarían de muy mala fe en operación, cuya utilidad no se comprenderá en lo general hasta que esté establecida la contribución.*"

[77] Barbara Naddeo has recently explored the contributions of Giuseppe Maria Galienti to these efforts, see Barbara Naddeo, "A Cosmopolitan in the Provinces: G. M. Galanti, Geography, and Enlightenment Europe," *Modern Intellectual History* 10, no. 01 (2013): 1–26.

national economy. As Enseanda notes, however, this effort would also necessitate a new type of local official – one who was paid by the central government and understood the science of counting in order to maintain the accuracy of local data for the Royal Treasury. Aside from the economic benefits of the survey, Ensenada also championed how this effort would reestablish good faith (*buena fe*) in the monarchy.[78]

Surveying for the *Catastro* of Ensenada lasted from 1750 to 1754.[79] Since the survey included more territory than any previous Spanish economic census, it helped produce an image of an increasingly united Spain, its resources, and its markets.[80] The methodology adopted for the survey combined an inquisitorial approach with a physical plat rendering for each property.[81] Parties of officials were dispatched with a set of forty questions regarding the size, yield, tax scheme, ownership, and production of each property. Accompanying these officials was a separate party of surveyors who were instructed to measure boundaries, elevation, and environmental conditions for the same entries. Thus, each household, farm, or royally owned plot of land was described, its physical parameters reduced to geographical coordinates, measured, and its economic potential assessed by independent teams of roving governmental officials. Importantly, once this information had been collected, it was reviewed, synthesized, and copied into an official ledger. The findings were then read publicly, so that any disputed information

[78] See, e.g., Marqués de la Ensenada to King Ferdinand VI, Aranjuez, 27 May 1748. "*Representación de Ensenada al Rey sobre reforma de la Real Hacienda y catastro de Castilla*" as transcribed in Villa, *Don Cenon de Somodevilla, marqués de la Ensenada*, 85–91.

[79] Parts of the *Catastro* surveying process continued until 1757, while analysis of the data would continue until 1759.

[80] As specified earlier, the *Catastro* did not include all of peninsular Spain (see footnote 75). For more on the *Castastro de Ensenada*, see: Antonio Matilla Tascón, *La única contribución y el catastro de la Ensenada* (Madrid: Servicio de Estudios de la Inspección General del Ministerio de Hacienda, 1947); Gómez Urdáñez, *El proyecto reformista de Ensenada*, 186–190; Concepción Camarero Bullón, "Informe del Consejo de Hacienda a Carlos III sobre el Catastro de Ensenada, 1779," *CT/Catastro* 51 (July 2004): 67–107.

[81] A summary of the methodology is provided by Camarero Bullón, see: Camarero Bullón, "El Catastro de Ensenada, 1749-1759: diez años de intenso trabajo y 80.000 volúmenes manuscritos," 78–83.

could be verified and corrected before the surveyors moved to a new area. At its height, in 1752, the *Catastro* employed over nine-thousand persons; two-thirds of whom were in the field taking measurements.[82] The *Catastro* was an exhaustive operation that collected information about the Spanish peninsula of unparalleled quality. Ensenada ensured this through the rigorous methodology he insisted upon. Indeed, his *Catastro* was not simply a cadastral survey, but also enumerated the regional population, livestock, forestland, agricultural production, and industrial production. Its expansive scope allowed it to establish definitive toponyms and nomenclature that erased confusion between the central and local governments. Furthermore, the treasury gained a complete catalog of all income derived by individual, industrial, commercial, and regal taxation. For the first time, a completely quantified vision of the monarchy was possible.

Copies of the survey results were sent to Madrid, where ministers used them to calculate new rates for taxation. However, no action was taken and the single tax was first stalled, and then abandoned. Still, the effort did influence the popular decision to remove tax collecting from private entities and place it within the state system beginning in 1750. Had the single tax been implemented, the combined effect of the single tax, the proposed nationalization of revenue collection, and the *Ordenanza de Intendentes* – which was decreed on 13 October 1749 – would have represented a total restructuring of the national economy in both administration and purpose. Meanwhile, Ensenada had continued to promote vigorous economic development in 1752 with the establishment of the *Giro Real*.[83]

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[82] Ibid., 86.

[83] A banking institution, the *Giro Real* centralized all currency transfers from outside Spain. By placing the *Real Hacienda* at the center of all transfer, the sale of goods to foreign bodies was done at rates favorable to the state. This would be further codified under Charles III with the establishment of the Bank

While Ensenada had designed the *Catastro* effort to emulate the successful British and French cadastral surveys, his effort fell short in one important way: it lacked trained cartographers who could use the survey information to make precise maps of Spain. The cartographic production of the *Catastro de Ensenada* varied wildly in quality, and reflects the level of technical education that the government officials dispatched received prior to their service. Thus, while the information collected produced an accurate depiction of the cities, towns, and farms of Castile, the mapping component of the effort was not as successful. One reason for the varied levels of precision of the *Catastro* maps was the coincidence of this project with the contemporaneous effort to produce an atlas of peninsular Spain described earlier in this chapter. Areas where geographers engaged in the atlas project worked alongside surveyors employed by the *Catastro* yielded far more precise maps than those that were mapped without geographers working to complete the peninsular atlas project present. Unfortunately, a detailed analysis of the cartographic products of the *catastro* is beyond the scope of the current project.[84]

The *Catastro* was not Ensenada's first attempt to conduct national-scale survey of internal resources. John T. Wing has noted that as part of the shipbuilding plan designed and led by Ensenada, naval officers conducted systematic surveying of the natural resources of the peninsula from 1737 to 1739.[85] Their efforts were designed to locate and catalog timber, but also acted to expand monarchial control and territorialization of

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of San Carlos. For more on this institution, see: Earl J. Hamilton, "Plans for a National Bank in Spain, 1701-83," *Journal of Political Economy* 57, no. 4 (August 1, 1949): 315–336.

[84] Concepción Camaero Bullón has produced a number of excellent articles analyzing the cartography of the *Catastro*, see, e.g., Concepción Camarero Bullón, "La cartografía en el catastro de Ensenada, 1750-1756," *Estudios geográficos* 59, no. 231 (1998): 245–283.

[85] For more on this effort, see John T. Wing, "Spanish Forest Reconnaissance and the Search for Shipbuilding Timber in an Era of Naval Resurgence, 1737-1739," *Journal of Early Modern History* 18, no. 4 (2014): 357–382. These forests, which were formerly managed on the local or regional level, became the object of national administration; this shift was codified in 1748 by a national forestry code.

natural resources within the peninsula. Naval officers were sent to assess the quality of timber and the ease of access, but, unsurprisingly, other geographic data was often collected, including soil quality, road conditions, local property organizations, and potential for future agricultural estate development. Further, although these territories were on the peninsula, they were entirely unknown to the central government, something that leads Wing to label the effort "domestic trips of exploration."[86] The forestry efforts of the mid-eighteenth century were not, in fact, innovative. Philip V had attempted similar efforts during his reign and earlier Habsburg monarchs attempted to regulate timber stocks and curtail illicit cutting, beginning with Philip II. What is unique about the eighteenth-century efforts was the effective manner in which Ensenada directed them in support of his successful naval growth project.

While previous historians have viewed the single tax plan of Ensenada in purely economic terms, Díez de Ulzurrun argues that it ought to be analyzed for its political contributions as well.[87] The three strata of the single tax plan – the direct collection of taxes by the *Real Hacienda*, the reduction to a single tax and cadastral survey to support it, and the office of the *Intendente* who collected the payments – all worked, according to Díez de Ulzurrun, to further the creation of a centralized absolutist monarchy and to curtail local authority of the *cortes*.

The erosion of provincial authority also allowed for the central government to promote a unified and comprehensive demographic and economic image of peninsular Spain. That is, when the *reinos* had been invested with the authority to collect their taxes, the stability or vibrancy of their individual economies and populations could remain

[86] Ibid., 359.

[87] Javier María Donézar Díez de Ulzurrun, "Los decretos de la Real Hacienda de 1749: los poderes locales y la representación del reino," *Historia moderna* 12 (1999): 299.

hidden from the monarchy. When the monarchy invested that same power, previously held by *cortes*, in the treasury, a comparative statistical assessment naturally followed. When the single tax plan fell through in 1756, local authorities responded with an institutionalized protest through the *Disputación del Reino*. The nature of the complaints show that the challenges of a single tax lay not only in implementing it, but also in how it threatened to undermine entrenched provincial authority. Representatives of the constituent kingdoms of Spain lamented the rise of centralized power and the erosion of a relationship between King and Kingdom, the traditional and historical structure of power. As Norman Hargreaves-Mawdsley opined:

> In the eighteenth century Spain's territorial divisions still kept the feudal units of the Middle Ages, something so bound up with the jealously guarded traditions of Spanish culture as not to be lightly swept away. Confused and disorderly they may have been, but they were Spain.[88]

One of the challenges to Ensenada's single tax, then, was a problem of geographic imagination.[89] One group, led by Ensenada, was working to advance the geographic vision of a single, comprehensive, unified Spanish state and another group (predominantly the aristocracy) still imagined Spain through its historical legacy as independent, constituent kingdoms of a "composite monarchy."

The unified vision of the Iberian Peninsula achieved by the *Catastro* in the center of power inspired another noteworthy reform project – the reform of the system of canals and roads connecting the Spanish peninsula. By understanding the yields and consumption needs of each region, the necessity of an improved transportation network became apparent to Spanish reformers. In 1750, peninsular Spain existed as a nation

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[88] W. N. Hargreaves-Mawdsley, *Eighteenth-Century Spain, 1700-1788: A Political, Diplomatic and Institutional History* (Totowa, N.J.: Rowman and Littlefield, 1979), 9.

[89] For more on geographic imagination, see the detailed discussion in the introduction to the present work, pp. 8-10.

without any managed roads. The dirt tracks that could be followed in the summer became impassable from mud and river overrun during the winter. Travel, then, was seasonal and fractured, inhibiting commerce and communication.[90] It is equally true that, as Michael Shaw has argued, roadwork and canalization projects mirrored the entire Bourbon reform project, inasmuch as the viability of linking all transport to Madrid was a predictor of the viability of running a centralized government from there as well.[91]

The crude status of Spain's road and canal system became a subject of many mid-century *arbitristas*, including Martín Sarmiento and Tomás Manuel Fernández de Mesa.[92] These writers, and others, imagined a network of roads and canals like those of France or even the Roman Empire, linking the provinces to each other and to the capital as the most effective means of revitalizing the Spanish economy and asserting centralized authority. Sarmiento called for thirty-two roads to connect the provinces, while Fernández de Mesa placed importance on the durability and scale of the roads. Their plans were for grand roads with ornate bridges, but such plans were unrealistic given financial and labor constraints. Later Spanish ministers, notably Gaspar Melchor de Jovellanos, were critical

[90] For more on the status of Spanish roads in 1750, see Santos Madrazo, *El sistema de comunicaciones en España, 1750-1850* (Madrid, Spain: Colegio de Ingenieros de Caminos, Canales y Puertos: Ediciones Turner, 1984), 17. For much of the eighteenth century, roadwork was heavily reliant on military engineers. These men, few in number and stretched thin between domestic projects, were unable to address the volume of problems in the road system. The foundation of the *Escuela de Caminos* in 1802 eased the burden on military engineers and educated civil engineers who could address the maintenance needs of Spain's road network.

[91] Shaw, "El siglo de hazer caminos," 414.

[92] Martín Sarmiento, "Libro que comprende dos discursos del padre Martín Sarmiento sobre caminos reales y de travesía", n.d., MSS/1975, Biblioteca Nacional de España; Tomás Manuel Fernández de Mesa y Moreno, *Tratado legal, y politico de caminos publicos, y possadas. Dividido en dos partes. La una, en que se hable de los caminos; y la otra, de las possadas: y como anexo, de los correos, y postas, assi publicas, como privadas: donde se incluye el Reglamento general de aquellas, expedido en 23. de abril de 1720.* (Valencia: J.T. Lucas, 1755). Sarmiento and Fernández de Mesa both enjoyed the patronage of the condes de Aranda, Campomanes, the marqués de Ensenada, and Ricardo Wall. These were the ministers in the governments of Ferdinand VI and Charles III who oversaw the road and canal system and had to the power to act on Sarmineto and Fernández de Mesa's recommendations.

of the proposals of these *arbitristas*, suggesting that a few *caminos reales* ought to be supported by a larger network of regional or provincial secondary roads.[93]

Underlying all of these reforms was investment in the science of geography by the state. Refinement of the geographical definition of Spain had been achieved by, first, envisioning a unified Spanish nation and, second, by promoting a culture of counting and measuring. Despite the inability of Ensenada to complete and implement some of his projects, the effort to quantify the monarchy had provided the data necessary to govern 'scientifically.' Ensenada's radical shift in taxation remained only partially implemented, but his *catastro* had produced the most comprehensive set of data ever collected describing the economic and demographic character of the Spanish countryside. His domestic mapping projects remained incomplete, but through foreign education of Spaniards and the immigration of British and French artisans he had successfully created the foundation for the reforms that would be enacted by the next generation of ministers. It now fell to men such as Floridablanca, Campomanes, and Jovellanos to take up Ensenadean reform.

Conclusion

A political crisis ensued after the death of José de Carvajal y Lancaster in 1754. Opponents of Ensenada (and the Jesuits) protested their growing influence within the Spanish Monarchy. Through the influence of the Fernando da Silva, Duke of Huéscar (1733-1770), the temporary Secretary of State and friend of British ambassador Benjamin Keene, Ricardo Wall emerged as an oppositional candidate to Ensenada. Together

[93] Gaspar de Jovellanos, *Informe de la Sociedad Económica de esta Corte al Real y Supremo Consejo de Castilla en el expediente de ley agraria* (Madrid: En la imprenta de Sancha, 1795), 132–134.

Huéscar and Wall petitioned the king and queen directly to dismiss Ensenada. He was summarily arrested, exiled to Granada, and satirized *in absentia* for his personal excess and supposed ministerial overreach. John Lynch argues, convincingly, that the charges brought against Ensenada are evidence that his dismissal was politically motivated.[94] To Spanish elite, Ensenada personified a pro-French philosophy. Since entering office he had unabashedly advocated against British interests, but had never functioned to undermine Spanish interests. José de Carvajal had served as a balance to Ensenada, advocating for regional authority and stronger relations with Britain. With the death of Carvajal, Ensenada was toppled by those who favored a pro-English and anti-Jesuit policy.

It is helpful to view Ensenadean reform in light of the utopian novel *Sinapia*, seeing in both idealism for the potential of inverting Spanish culture and governance. The rise of central institutions for scientific education, the appropriation of foreign knowledge, and the motif of inversion all illuminate aspects of Ensenada's program. Adapting, but not emulating, the successes of Colbertian France, Ensenada pursued a program of geographical governance.

From 1743 until 1754, the marqués de la Ensenada had pursued a bold path of state reform. His objectives were centralization of political and economic authority, simplification of revenue structures, the growth of naval power as both a defensive and diplomatic necessity, and the rise of a bold, new, modern Spain. These were all dependent on the science of geography. The quantification of the Spanish monarchy – achieved both by his patronage of promising Spaniards for scientific and technical

[94] Lynch, *Bourbon Spain, 1700-1808*, 184. In 1754, Ensenada had offended the queen of Spain, María Bárbara of Portugal, by opposing terms of a territorial exchange between Spain and Portugal related to the Treaty of Madrid (1750). While he lost her favor, this was not the sole cause of his dismissal.

education abroad and the *Catastro* project – provided the necessary data to implement rational reform aimed at each of his objectives. Ensenada's dismissal before either the return of López and Cruz Cano from Paris or the completion of the *Catastro* prevented him from implementing these reforms, but a new generation of ministers would complete the projects Ensenada had begun.

Part II
Chapter Three
The Treaty of Madrid and Demarcation of the Limits

The Banda Oriental is "an imperfect and unknowable landscape," José Varela y Ulloa wrote to the Amazonian Boundary Demarcation Commission in 1782.[1] "It would be more useful to construct permanent markers, rather than rely on natural boundaries, owing to the evolving nature of the terrain." Varela wrote from Rio de Janeiro, where he was one of many agents of the two Iberian crowns charged with demarcating a permanent boundary between their realms in Ibero-America. Almost thirty years earlier, long simmering political and economic tensions in the region had motivated the effort for a peaceful resolution to these issues. The Treaty of Madrid (1750), which attempted not only to settle Iberian territorial disputes but also economic tensions between Spain and Great Britain, was informed by an ambitious cartographic project: the Boundary Demarcation Commission. The planning and execution of this project illustrates the development of new expertise in geographic science in Spain and a new appreciation by the state for the precision and certainty of cartographic sovereignty, meaning the acceptance of mathematical cartography as evidentiary claims of sovereignty. In cartographic sovereignty the map became both the claim of sovereignty and the evidence of the claim. The empirical measurement that underlay mathematical cartography implied physical presence in the region, making material claims of sovereignty less and less important.

[1] José Varela y Ulloa to Fernán Núñez. Rio de Janeiro, 4 April 1782. Archivo Histórico Nacional (AHN) Sección Estado, 3386, Exp. 8. "*una tierra ni perfecto ni legible […] será más util los limites marcados qué los de limites naturales porque la tierra está cambiado en todo tiempo.*"

The contested region, or Banda Oriental, encompassed lands east of the Uruguay River and north of the Río de la Plata in present day Uruguay, Argentina, and Brazil. The disputed region also included present day Paraguay and treaties – when finally settled – ceded territories that correspond to the totality of present-day Brazil. Contemporaries referred to the disputed region as the Amazon, Brazil, Río de la Plata, and India – among other terms. This ambiguity in nomenclature belies the uncertainty surrounding the very nature of the surveyed territory. The abstract description of the region provided by Varela y Ulloa also shows the degree to which cartographic production was accompanied by shifts in geographic thought, including ecological conceptualizations of the landscape. The land was "imperfect" and "unknowable," an area that was constantly "evolving." By its very nature, this landscape challenged traditional methods of demarcating land ownership and instead demanded a conjunction of practices that matched the historical (historical accounts of ownership, natural boundaries, and permanent monuments) with the scientific (observationally based mathematical cartography). In Spanish America and elsewhere, Bourbon Spain mobilized a mixture of these methods.[2]

The present chapter will examine Bourbon Spanish efforts to map and make legible to ministers in Madrid this contested Ibero-American space. While an unfortunate consequence of these efforts was the replacement of indigenous toponyms with Christianized ones, removal of tribes from their established areas of settlement, resource extraction, and superimposition of European politics on the landscape, the present chapter does not address these aspects of the surveying efforts and investigates, instead, how Bourbon ministers concerned with reform and diplomacy conceptualized the geography

[2] For discussion of other instances where mathematical and traditional practices of declaring sovereignty overlapped, see Chapter Five, pp. 245-255.

of the territory.[3] To do so, it analyzes the narrative of ministers and geographers about this specific region, the scientific effort involved, and the diplomatic processes that defined it cartographically. By doing so, I identify a changing attitude among Bourbon ministers towards cartographic knowledge and explain how cartography became an essential tool for defining sovereignty.

Visions of the Luso-Hispanic Boundary

Iberian perceptions of South American hinterlands as an abstract and imperceptible space date to the earliest encounters with the territory.[4] When Pope Alexander VI split the Indies between the Iberian crowns at Tordesillas, declaring that a line be drawn 370 leagues west of the Cape Verde Islands, the relative uncertainty over the definition of this boundary was complicated not only by imprecise measurement of the line, but also by the environment itself.[5] The terrain continued to challenge exact measurement of the region, even after the invention of the marine chronometer solved the longitude problem. Two hundred years after Tordesillas, seasonal flooding still submerged sections of the landscape and redirected the course of riverways, obscuring

[3] For an excellent study of the effect of these expeditions on erasing indigenous spatialities, see Neil Safier, "The Confines of the Colony: Boundaries, Ethnographic Landscapes, and Imperial Cartography in Iberoamerica," in *The Imperial Map: Cartography and the Mastery of Empire*, ed by. James Akerman (Chicago: University of Chicago Press, 2009), 133–183.

[4] For an overview of colonial mapping of the region, see Carmen Martínez Martín, "La cartografía política del Brasil colonial," in *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*, ed by. Mariano Cuesta Domingo and Alfredo Surroca Carrascosa (Madrid: Ministerio de Defensa, 2010), 247–274.

[5] For a full description the Treaty of Tordesillas and the Line of Demarcation, see Chapter One, pp. 47-50.

vital boundary markers and confusing the casual traveler whose maps were suddenly incongruous with the observed landscape.[6]

Initial European exploration of the Banda Oriental is described in the testimony of Ulrich Schmidl, a *Landsknecht* and agent of the Fugger bankers, who accompanied early Spanish settlers of the Río de la Plata in the 1530s.[7] Following entries to the Río de la Plata estuary, the exploratory party traveled northward along river networks that delivered them to Paraguay and the boundaries of modern Brazil. Schmidl's account recalls many dangerous interactions with local populations, but he also notes the "dampness" of the region that was at times "fertile," but also included "deserts, mountains, and valleys" populated by "wild beasts."[8] Álvar Nuñez Cabeza de Vaca, traveling southward from Ilha Santa Catarina in Brazil passed through the interior, echoing these earlier descriptions of a lush, yet dangerous environment.[9] These early accounts frame the region as consistently concealing its dangerous nature in intermittently lush, arid, mountainous, and flooded landscapes.

Interest in the region grew during the eighteenth century as European empires attempted to solidify their territorial claims as they sought new resource-rich colonial ventures. Perhaps owing to the difficulty of penetrating this landscape, Spanish

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[6] One eighteenth-century example is Alexander von Humboldt's proof of the seasonal linkage between the Orinoco and Amazon, see Safier, "The Confines of the Colony: Boundaries, Ethnographic Landscapes, and Imperial Cartography in Iberoamerica," 133–134. Humboldt describes navigating a "labyrinth of rivers" through "impenetrable forests."

[7] He was part of the Sebastian Cabot expedition that was attempting to complete the mission of Juan de Solis, who had been killed at the mouth of the estuary during his voyage to the region in 1516. For Schmidl's account, see Ulrich Schmidel, *Relatos de la conquista del Río de la Plata y Paraguay, 1534-1554*, ed by. Klaus Wagner (Madrid: Alianza Editorial, 1986); Luis L. Dominguez, ed., *Conquest of the River Plate (1535-1555): Translated for the Hakluyt Society with Notes and an Introduction* (Cambridge: Cambridge University Press, 2010).

[8] For these quotes, see Dominguez, *Conquest of the River Plate (1535-1555)*, 46–47; 72; 82. Schmidl describes the region during travel from the Paraguay River to the Gran Chaco.

[9] Ibid., 106–107. Cabeza de Vaca and his men marched "into the interior of the land, where he and his people underwent many troubles. In nineteen days they crossed great mountains, cutting roads through forests, to enable the men and the horses to pass, for all the land was uninhabited."

settlement of the Banda Oriental remained sparse. Laura Benton has described how European empires were constructed through "corridors" and "enclaves," explaining territorial sovereignty as a fluid concept.[10] This was certainly the case in the Banda Oriental. Jorge Juan and Antonio de Ulloa described the area as an "alley" of sovereignty in their account of travel through the region as part of the 1735 French-Spanish expedition to measure the global meridian.[11] Juan and Ulloa – along with their expedition leader, Charles Marie de La Condamine – were not entering an unknown space, however. By the eighteenth century a significant number of travel accounts and maps existed, each promising the readers a "true and accurate" description of the region.[12] While movement through the region continued throughout the seventeenth century, expeditions that penetrated the interior with the objective of measuring the terrain were not a part of such travel. It was not until 1748 that cartographic images based upon astronomical measurements of longitudes and latitudes for important urban centers and strategic economic regions, such as Río de Janeiro, São Paulo, Río de la Plata, and the mining zones of the north started to appear.[13]

For the hinterlands, the anonymous *Mapa de los dominios de España y Portugal en la America Meridional* (1750) is representative of the persistent geographic ignorance

[10] "Empires did not cover space evenly but composed a fabric that was full of holes, stitched together out of pieces, a tangle of strings." Lauren Benton, *A Search for Sovereignty: Law and Geography in European Empires, 1400--1900* (Cambridge: Cambridge University Press, 2010), 2.

[11] Jorge Juan and Antonio de Ulloa, *Relacion historica del viage a la America Meridional hecho de orden de S. Mag. para medir algunos grados de meridiano terrestre y venir por ellos en conocimiento de la verdadera figura y magnitud de la tierra, con otras observaciones astronomicas y phisicas* (Madrid: por Antonio Marin, 1748), 408–409. "*[…] pero mucha parte de ellas, o se hallan habitadas de Naciones Barbaras de Indios, o no estan hasta el presente bastantemente pobladas de Españoles, y conocidas. Lo que con rigor pues se debe reputar por poblado en aquel vasto Pais es el espacio, que dejan entre si las dos Cordillera de los Andes, formando como un Callejon desde el Corregimiento de la Villa de San Miguel de Ibarra hasta el de Loja […]*"

[12] Neil Safier, *Measuring the New World: Enlightenment Science and South America* (Chicago: University of Chicago Press, 2008), 57–62; Martínez Martín, "La cartografía política del Brasil colonial," 251–266.

[13] Martínez Martín, "La cartografía política del Brasil colonial," 269.

of Amazonia in European courts (see Figure 3.1).[14] South America is misshapen and, paradoxically, the Amazon is depicted as a transcontinental river, despite such a conceptualization being thoroughly disproved by this time. *Mapas de los dominios* is a crude image and bears a closer resemblance to the production of a fifteenth or sixteenth century cartographer than it does to the exact cartographic representation eighteenth century ministers required. However, this was the type of poorly informed and mathematically incoherent map that the ministers discussed in this chapter had at their disposal. In order to redraw the Ibero-American boundary, geographic knowledge of the region, including precise cartographic images, would be required.

These deficiencies were not uncommon in maps of the Amazon, making the *Mapa de los dominios* a good indication of the challenges faced during territorial negotiation. Even as surveyors were dispatched to measure the Amazon and produce new maps to inform the negotiations, they encountered challenges orienting themselves in the landscape with the available images. Veracity within the cartographic image was piecemeal and imperial agents spent their travels correcting and validating previous accounts, which were often consulted *in situ* from traveling libraries.[15] Such corrections did not offer a comprehensive vision of the Ibero-American boundary or the surrounding territory, however, but rather offered only sporadic glimpses into the thick, lush forest. Complicating matters, the two neighboring powers had implicit interests in concealing

[14] *Mapa de los dominios de España y Portugal, en la America Meridional* [Manuscript map], 1º Lat. = 1,4 cm, 1750. Cartoteca, Centro Geográfico de Ejército Ar.J-T.9-C.3-30.

[15] For more on the consultation of works regarding Amazonia, see Neil Safier, "'Every day that I travel ... is a page that I turn': Reading and Observing in Eighteenth-Century Amazonia," *Huntington Library Quarterly* 70, no. 1 (March 2007): 103–128. For consulting books in the field across Ibero-America in the eighteenth century, see: Daniela Bleichmar, "Exploration in Print: Books and Botanical Travel from Spain to the Americas in the Late Eighteenth Century," *Huntington Library Quarterly* 70, no. 1 (March 1, 2007): 129–151; Matthew E. Franco, "Bridging the Divide: Science and Reform in the Spanish Navy (1783-1805)" (Master's Essay, Baltimore, MD: The Johns Hopkins University, 2011), 39-75.

details of the American space from each other, leading to a cartographic culture that perpetuated vague maps that included ‘blank spaces’ long after the first era of exploration

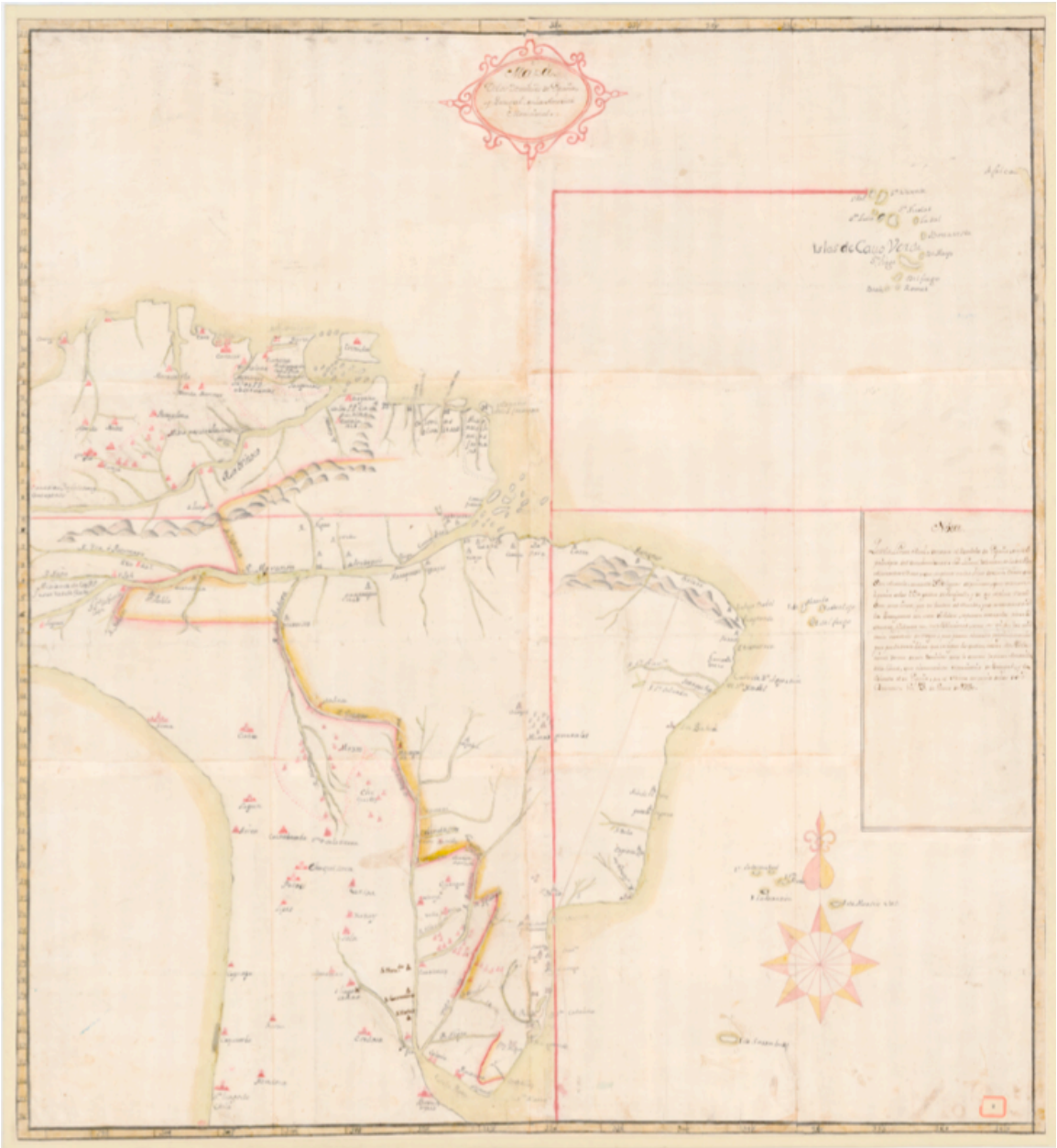

Figure 3.1 ***Mapa de los dominios de España y Portugal en la America Meridional*** **(1750)**

through the region. As Safier quips: "imperial rivalries made for bad maps."[16] Monarchial visions of the Ibero-American boundary before 1750, then, were only possible on a grand, continental scale, where the details of demarcation were obscured and natural features of the landscape were either omitted or under seasonal fluctuation.

The publications of Charles Marie de La Condamine, Jorge Juan, and Antonio de Ulloa attempted to clarify territorial boundaries in the years leading into negotiations for the Treaty of Madrid. La Condamine published two accounts of his travels through Amazonia: the *Relation abrégée*,[17] which detailed the entirety of his scientific exploration, and the shorter *Extracto*,[18] which La Condamine used to abridge his journal and target the work for a Spanish speaking audience. Neil Safier has pointed out how the size and brevity of the second publication, the *Extracto*, allowed the observations of La Condamine to travel "not only to monarchs' libraries and the sitting rooms of *les grands* but into the hands of Iberian explorers and statesmen as well."[19]

Responding in part to La Condamine and his publications, Jorge Juan and Antonio de Ulloa published their own book in 1749 specifically tailored to issues concerning the Ibero-American boundary – the *Dissertacion historica y geographica*.[20] This work was published only a year after their *Relacion historica del viage a la America Meridional*, which only addressed the question of the Luso-Hispano boundary in a

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[16] Safier, "The Confines of the Colony: Boundaries, Ethnographic Landscapes, and Imperial Cartography in Iberoamerica," 134.

[17] Charles Marie de La Condamine, *Relation abrégée d'un voyage fait dans l'interieur de l'Amérique méridionale depuis la côte de la Mer du Sud jusqu'aux côtes du Brésil et de la Guiane, en descendant la Rivière des Amazones*. (Paris: Veuve Pissot, 1745).

[18] Charles-Marie de La Condamine, *Extracto del Diario de observaciones hechas en el viage De la Provincia de Quito al Pará, por el Rio de las Amazonas□; y del Pará a Cayana, Surinam y Amsterdam: destinado para ser leido en... la Academia Real de las Ciencias de Paris...* (Amsterdam: En la Emprenta de Joan Catuffe, 1745).

[19] Safier, *Measuring the New World*, 111.

[20] Jorge Juan y Santacilia and Antonio de Ulloa, *Dissertacion historica y geographica sobre el meridiano de demarcacion entre los dominios de España, y Portugal etc* (Madrid: En la Imprenta de Antonio Marin, 1749).

general manner. In the *Dissertacion*, by contrast, Juan and Ulloa focused on the grave problems that had arisen from the Portuguese "taking possession" of the country, "without having [made efforts] to legitimize their possession."[21] The frontline of Portuguese possession was, Spaniards feared, constantly creeping westward into the unexplored forests inhabited only by indigenous peoples and wild beasts. While Juan and Ulloa acknowledge that foreign and domestic cartographers had attempted to map the American boundary, consensus was difficult to achieve because of disputed landmarks, toponyms, and measurement methodologies. Juan and Ulloa point to the reliance on river pilotage and 'nautical charts' to define the hinterland space as one consistent challenge.[22] The time had come, the authors concluded, for a systematic and comprehensive mapping expedition to demarcate a permanent boundary and legitimize its current residents.

Diplomacy and the Treaty of Madrid

The Treaty of Madrid was born of the mid-eighteenth century desire to "end past and future disputes" caused by the fifteenth-century treaties of Tordesillas and Zaragoza, as well as the early-eighteenth-century Treaty of Utrecht, by "forgetting and not exercising all of the actions and rights that may belong to" Spain and Portugal.[23] During the relatively tranquil period between the *Guerra del Asiento* (1739-1748; or War of

[21] Ibid., 120–121. "*[L]os Portugueses se han apoderado de la mayor parte de aquel Pais, solo ha sido por la via de hecho, sin que haya contribuido a legitimar su possesion, no el hallarse dentro de los terminos de su Demarcacion, ni el haver sido primeros Descubridores de aquel territorio; pues de uno, y otro extremo carecen*."

[22] Ibid., 63–64.

[23] "Tratado entre las dos Coronas de España y Portugal sobre la demarcación de los Limites pertenecientes a cada una en América," AHN, Estado 3366, Exp. 22, f. 7v. "*Han resuelto poner termino a las disputas pasadas y futuras, y olvidarse y no usar de todas las acciones y derechos que puedan pertenecerles en Virtud de los referidos tratados de Tordesillas, Lisboa, y Utrecht y de la Escritura de Zaragoza, o de otros cuales quiera fundamentos que puedan influir en la división de Sus Dominio por línea meridiana*." The Treaty of Madrid is also sometimes referred to, both historiographically and by contemporaneous actors, as the Treaty of Boundaries (*Tratado de Límites*).

Jenkins' Ear) and The Seven Years' War (1756-1763) – in which Spain had been a party, joining the latter as part of its alliance with France and to defend its trading rights – José de Carvajal and the marqués de la Ensenada felt empowered to settle longstanding disputes in territorial rights and access to America's internal markets.

The Treaty of Madrid addressed economic and political issues as well. Access to Spanish America by French, British, and Portuguese merchants was only one source of stress on the Spanish colonial economy that Bourbon ministers in Madrid and the Americas faced. Still, as Fernando da Silva, the Duke of Huéscar, wrote to Ricardo Wall, then the Spanish ambassador in London, the continuing penetration of supposedly closed Spanish-American ports by foreign merchants "directed" Spanish foreign policy to favor certain nations over others.[24] As part of a separate treaty, Carvajal had paid Britain to forgo the final four years of its *asiento*.[25] While certain tensions with Britain were not addressed by the treaty, British access to Peru through the Portuguese port of Colônia do Sacramento in the Río de la Plata estuary was one issue that featured prominently in the negotiations preceding the Treaty of Madrid.[26]

The Portuguese monarchy, meanwhile, saw Ferdinand VI of Spain's marriage to his Portuguese born wife, María Bárbara of Portugal, as advantageous to their territorial

[24] Writing from Paris in 1747 regarding continued French penetration of the south American coasts, Huéscar lamented to Wall that France might well push Spain away from itself and direct Spain into England's embrace. "[S*]olicitar que nuestro sacrificio sea la Francia quien lo dirija, para que el Sentimiento que produzca en nosotros nos aparta de esta Potencia, y nos encamine a estrecha con Inglaterra*." Duque de Huéscar to Sr. Ricardo Wall, Paris 18 October 1747. AHN, Estado 3386, Exp. 2. The Hispano-Franco and Hispano-Anglo tensions surrounding the treaty are detailed by Kuethe and Andrien in their recent monograph on the Spanish Atlantic, see Allan J. Kuethe and Kenneth J. Andrien, *The Spanish Atlantic World in the Eighteenth Century: War and the Bourbon Reforms, 1713–1796* (New York: Cambridge University Press, 2014), 195–197.

[25] Ibid., 195.

[26] Tensions remained over British logging in Honduras, fishing in the upper Atlantic, maritime conflicts in the Caribbean, and, always, Great Britain's possession of Gibraltar. John Lynch, *Bourbon Spain, 1700-1808* (Oxford, UK: B. Blackwell, 1989), 179–182.

expansion in Brazil.[27] After successive armed conflicts over the course of the first half of the eighteenth century, diplomacy advanced in 1750 without armed conflict and a treaty, primarily negotiated for Spain by José de Carvajal y Lancaster, and for Portugal by the Visconde de Vila Nova de Cerveira and Tomás da Silva Teles, was signed in Madrid on January 13, 1750. Under its terms Portugal ceded Colônia to Spain, which agreed to recognize Portuguese expansion in two regions of Amazonia – one in the north and another in the Jesuit region of the south. It was the latter concession, encompassing seven of the thirty Guaraní missions of Paraguay, which proved to be most controversial in America, as the Jesuit missionaries opposed their forced relocation.[28] Further complicating matters, the terms of the treaty partitioned unoccupied land and indigenous settlements in these remote areas, which often straddled the imposed European boundaries.[29] The treaty was unpopular with all parties, but Spain advanced in its mission to curb the illicit Río de la Plata trade and Portugal had gained vast, resource-rich tracts of land to complement their already sizable colony. In renegotiating the location of the meridian line defined by the Treaty of Tordesillas and the Treaty of Zaragoza, the Treaty of Madrid also impacted global geopolitics. Iberian sovereignty claims in the Pacific Ocean world were one area of greatest impact, as is discussed in Chapter Six.

With regard to the science of geography and its use in diplomacy, the Treaty of Madrid marked a drastic departure from Spain's negotiations at Utrecht. There, as discussed in Chapter One, French and British plenipotentiaries had used commercially

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[27] For the Portuguese perspective on the Luso-Hiapnic boundary, see "Brasil Limites," Arquivo Histórico Ultramarino (AHU), Conselho Ultramarino (CU), série 59, caixa 1-4.

[28] These seven missions, known as the Misiones Orientales, were located on the east side of the Uruguay River. When Portugal was granted control of the area east of the river the Jesuits and Guaraní residents were told they would have to relocate to the west coast of the river, back into Spanish territory.

[29] J. H. Elliott, *Empires of the Atlantic World: Britain and Spain in America, 1492-1830* (New Haven: Yale University Press, 2006), 268–269.

available, popular charts of the Acadian region to settle their boundaries disputes. French ministers had negotiated the Spanish interests on the basis of historical geographic claims, reliant on early modern manuscripts that provided vague, general understandings of highly porous boundaries. After the resurgence in Spanish geography described in the preceding chapters, Spanish diplomats now had access to a geographic science that was in a position to defend monarchial interests by using precise astronomical data to settle boundary disputes.

This new scientific ethos was reflected – albeit, in highly rhetorical language – during the discussions of the Treaty of Madrid. Commenting on the insufficiency of previous generations of ministers to accurately and amicably settle the American boundary between Spain and Portugal, the ministers wrote that following Tordesillas:

> [T]here was a unique difficulty to indicate the line and beginning of the demarcation, because the Pope neither said from which of the Cape Verde Islands to begin the account, nor was it declared in the Treaty of Tordesillas, [and] neither did the two nations determine it, nor did they send geographers to mark it, so that all [of these issues] gave rise to disputes and provisional treaties in order to avoid the difficulty and tedium of the controversy, an account of which is omitted as irrelevant and garrulous. What has been said is enough in order to understand that even now, when the longitudes of Asia are well measured, the same difficulty arises, and it has been necessary to arrive at an amicable settlement, mainly affected by reasons of public utility, and others of particular benefit to the two sides [*partes*].
>
> Among the public utilities agreed upon as a preliminary arrangement at this favorable juncture that now bear repeating were the relationship between the sovereigns, and the concept that we are of one people (*nación*), of a single faith, and with scant differences in language and customs.[30]

[30] "Papeles pertenecientes a la anulación del Tratado de limites del año de 1750," Archivo Histórico Nacional (AHN), Estado Leg. 3386, doc. 4. The cited documents is in a collection of letters from Queen María Bárbara de Portugal to José de Carvajal contemporaneous to the original treaty, and from Ricardo Wall to King Charles III lobbying to annul the treaty and negotiate a new agreement during the 1760s. While undated, the quoted document appears to be from the 1750-1751 negotiations. "*Era la única dificultad señalar la línea y principio de la demarcación, porque ni el Papa dijo desde qual de las islas de Cabo Verde se había de empezar la cuenta, ni se declaró en el Tratado de Tordesillas, ni lo determinaron las dos Naciones, no enviaron geógrafos para señalarla, de forma que todo se redujo a disputas, y tratados provisionales para huir la dificultad, y el tedio de la controversia, cuya relación se omite como impertinente, y prolija. Basta lo dicho, para que se entienda que aún ahora que esta mas bien averiguadas*

A new age of diplomacy was being heralded by Iberian ministers at mid-century, one in which geographic science could correct and clarify historical inaccuracies. Geography could now accurately measure longitudinal and latitudinal markers, even in the challenging American hinterland.[31] What remained, according to this agreement, was the willingness of both sides to create a new agreement that would be dictated by a physical survey, the most precise astronomical measurements possible and permanent markers to indicate the boundary.

Negotiations for a permanent boundary also demonstrate the familiarity of monarchs and their ministers with the cartographic evidence that would be used to design the boundary demarcation commission. Writing to María Bárbara of Portugal, José de Carvajal explained his goals for the Spanish territories in the Americas, and their boundaries, by describing how she should move her fingers across the manuscript map "to the left of what is shown in the map, and should the line remain unchanged, Your Majesty will see the damages that might befall us."[32]

When preliminary discussions for the treaty had begun late in the 1740s, the absence of acceptable cartographic imagery of certain regions affected the course of proposals. The Seven Missions area, in present day Uruguay, remained largely absent

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las longitudes de Asia, subsiste la misma dificultad, y ha sido preciso venir a una transacción amistosa, en que principalmente influyen razones de utilidad común, y otros de beneficio particulares a las dos partes.

Entre las de utilidad común concurrió como disposición previa la favorable coyuntura deberse ahora repetidos los parentescos entre los soberanos, y el concepto de que todos somos de una nación, de una religión, y muy poco diferente en idioma y costumbres."

[31] Increasingly accurate methods for the calculation of longitude developed during the first half of the eighteenth century, particularly by means of the lunar distance method. The marine chronometer developed by John Harrison in 1760 vastly improved the accuracy and ease of longitudinal calculations by allowing navigators and geographers to measure longitude by comparing relative time, a methodology developed as part of the horological work of Christiaan Huygens in the late seventeenth century.

[32] José de Carvajal to Doña Maria [Bárbara of Portugal]. N/L, 1750. AHN, Estado 3386, Exp. 4. "*a la izquierda de lo que muestra el mapa, y de no se alterar la linea. Vea pues Vuestra Majestad que daños caben en esto.*"

from Spanish cartographic collections. King João V's personal secretary, Alexandre de Gusmão, wrote to Visconde de Vila Nova de Cerveira instructing him not to share the maps in his possession, including those of d'Anville, with the Spanish plenipotentiaries.[33] Further, Marco António de Azevedo Coutinho, the Portuguese Secretary of State, and Tomás da Silva Teles used Spanish geographic ignorance of the region to strengthen their proposal for the boundary by referring to a map of the region being prepared in Lisbon by Alexandre de Gusmão.[34] This image, the so-called *Mapa das Cortes* (see Figure 3.2), resembles the *Mapa de los dominios de España y Portugal en la America Meridional* shown in Figure 3.1.[35] Both are images meant to illuminate a specific region of Ibero-America, but drawn on a continental scale. Most notably, it may be assumed that the cartographers who drew both maps relied on much of the same geographic data.

Leading into diplomatic negotiation of an Amazonian boundary in 1750, Portuguese and Spanish cartographers would have used older reports and maps including those of Jesuit cartographers to inform their maps. Mário Clemente Ferreira has described as much, citing La Condamine, Padre José Quiroga, and Padre Diogo Soares as major primary sources reflected in the *Mapa das Cortes*.[36] Other popularly available maps, such

[33] Jorge Pimentel Cintra and Júnia Ferreira Furtado, "A Carte de l'Amérique Méridionale de Bourguignon D'Anville: eixo perspectivo de uma cartografia amazônica comparada," *Revista Brasileira de História* 31, no. 62 (2011): 280.

[34] Ibid., 280, note 11; Mário Clemente Ferreira, "O Mapa das Cortes e o Tratado de Madrid: a cartografia a serviço da diplomacia," *Varia História* 23, no. 37 (2007): 53. For images of this map, see Alexandre de Gusmão, *Mapa dos Confins do Brasil com as terras da Coroa de Espanha na América, ou Mapa das Cortes* [map] in Cintra and Furtado, "A Carte de l'Amérique Méridionale de Bourguignon D'Anville," 281.

[35] Ferreira claims that the *Mapa de los dominios* was one of only two maps available to ministers in Madrid as they negotiated the treaty of Madrid. The other, *América de Sur* (1759), Archivo General de Simancas (AGS), MPD.IV-36, closely resembles the *Mapa de los dominios*, except to exclude representation of the Canary Islands.

[36] Ferreira, "O Mapa das Cortes e o Tratado de Madrid," 54, 59. In April 1750, Portuguese officials wrote to João Álvares de Gusmão, a friar, regarding hiring Italian Jesuit geographers and engravers for their surveying teams, see AHU, CU, s. 59, cx.1, d.4

Figure 3.2 Alexandre de Gusmão, *Mapa dos Confins do Brasil com as terras da Coroa de Espanha na América, ou Mapa das Cortes.* Lisbon: 1749

as those of Jacques-Nicolas Bellin and Jean-Baptiste d'Anville, might also be reflected therein, although their influence is contested.[37] Notably, maps by the above named figures may be found in the State Papers of the National Archives (Sección Estado, Archivo

[37] Ferreira argues that the influence of d'Anville has been overstated, tracing the disputed elements of the *Mapas das Cortes* to the influence of Matthew Seutter. For an argument for d'Anville's influence, see Cintra and Furtado, "A Carte de l'Amérique Méridionale de Bourguignon D'Anville," 278–281, 312–314.

Histórico Nacional), the Naval Archive (Archivo Museo Naval), the Center for Military Mapping (Centro Geográfico de Ejercicio), the General Military Archive (Archivo General Militar, Madrid). While possession certainly does not imply readership, the materials seem to have been available to ministers negotiating the treaty.

Setting aside the questions of its source material, Ferreira argues that it is clear that the *Mapa das Cortes* was a consciously constructed amalgam of various historic and contemporary maps. It distorted the extent of Portuguese encroachment in territories granted to Spain by Tordesillas, while greatly exaggerating the Spanish dominions westward by enlarging the continental width. In contrast, Spanish geographers attempted to accurately reflect the meridian line alongside current occupation of territories by the two powers, exercising none of the keen cartographic distortions employed by their Portuguese counterparts. Spanish geographers did not need to distort the cartographic image, since both sides acknowledged that Portugal had, in fact, extended beyond its legal boundaries. Spanish interests were best served by accurate maps demonstrating the degree to which their territory had been unlawfully occupied, while distorted maps suggesting that Spain possessed an equal amount of unoccupied land in westward Amazonia as Portugal occupied in the east best served Portuguese interests. As Ferreira concludes "the *Mapas das Cortes* is truly a cartographic construction with clear diplomatic objectives."[38]

The Treaty of Madrid, signed by Ferdinand VI of Spain and João V of Portugal on 13 January 1750, ended the contestation of the region and transferred territories between the two powers amicably. The text of the treaty opens with a long history of the region,

[38] Ferreira, "O Mapa das Cortes e o Tratado de Madrid," 65.

the treaties that had partitioned it in the past, and the causes of past territorial disputes, before concluding that Spain and Portugal wished to have the boundary marked in an unambiguous way. Their objectives were that:

> [F]irst, and principally, the boundaries of the two monarchies take as their limits the better known places so that at no time they may be confused, or give rise to disputes, such as the origin and course of rivers, and the most notable mountains; secondly, each monarchy will keep what it currently owns, except for mutual concessions as are stated [later in the document], which will be executed by joint agreement so that the limits remain as much as possible less subject to dispute.[39]

Much of the boundary demarcation, it was agreed, would rely on the legal principle of *uti possidetis, ita possideatis*.[40] That is, that nation which occupied a territory by fact then owned it by right. Likewise, the treaty favored natural boundaries, such as rivers and mountains, which could be easily identified by resident populations. In addition, the boundaries between Spanish and Portuguese territories would not rely solely on natural boundaries, but would be set according to longitudinal and latitudinal coordinates. Superseding the treaties of Tordesillas, Zaragoza, Utrecht, and others, the Treaty of Madrid promised to end all territorial disputes, in part through its reliance on mapping. A separate agreement between the plenipotentiaries signed four days later specified the

[39] "Tratado entre las dos Coronas de España y Portugal sobre la demarcación de los Limites pertenecientes a cada una en América," AHN, Estado 3366, Exp. 22, f. 7v-8v. "*[…] Han resuelto poner termino a las disputas pasadas y futuras, y olvidarse y no usar de todas las acciones y derechos que puedan pertenecerles en Virtud de los referidos tratados de Tordesillas, Lisboa, y Utrecht y de la Escritura de Zaragoza, o de otros cuales quiera fundamentos que puedan influir en la división de Sus Dominio por línea meridiana; y querer, que en adelante no se trate mas de ella, reduciendo los limites de las Dos Monarquías a los que se señalaran en el presente tratado siendo su animo que en el se atienda con cuidado a los fines: El primero, y mas principal es, que se señalen los limites de los Dos Dominio tomando por términos los parajes mas conocidos para que en ningún tiempo se confundan, ni den ocasión a disputas, como son el origen y curso de los ríos, y los montes mas notables: El segundo, que cada parte se ha de quedar con lo que actualmente posea, a excepción de las mutuas cesiones que se dirán en su lugar, las cuales se ejecutarán por conveniencia común, y para que los limites queden en lo posible menos sujetos a controversias."*

[40] For more on this Roman Law principle, see: Bryan A. Garner, ed., *Black's Law Dictionary*, 9th ed. (St. Paul, MN: West, 2009), 1686.

authority granted to the maps produced by the boundary demarcation commission.[41] Two identical manuscript maps, copies of the same definitive geographic vision, would ultimately be held by each court and were granted supreme authority over representing the American boundary. The ministers recognized, however, that those maps currently held by each court were, in all likelihood, based upon false information and fanciful invention. "Let us declare to ourselves," the ministerial agreement states,

> that although the information [already collected] by both courts most likely [describes] all the [places] to be marked on the cited manuscript map, these [coordinates], themselves, must be corrected [because] in some of the measured territories no living person has ever walked [*no los han andado personas que hoy vivan*], while in others [coordinates] have been added to the maps by reliable people who have walked [through the land]. [These observers], however, perhaps lacked expertise in skillfully drawing and so some visible variations of the land may be observable, such as the location of mountains, the origins and currents of rivers, and even with the naming of some of these, because they are often given different [names] by each Nation of *Indios*, or by other happenstance.[42]

The plenipotentiaries continued that all matters not addressed by their current agreement would be specified at a later time, but that the effort was to proceed as expediently as possible. The observational parties would be given a copy of these more detailed agreements, as well as the royal edicts ordering the surveying effort, both of which could be updated once the surveying effort had begun. While the political division of territories might change, the ministers were adamant that the instructions for proper observation and

[41] "Convención firmada por los dos Plenipotenciarios de SS MM Católica, y Fidelísima para que si se hallase alguna novedad en el Mapa Manuscrito aprobado por los dos soberanos para gobierno de los comisarios nombrados para hacer la demarcación, no sirva de embarazo, sino que prosigan hasta su debido efecto." AHN, Estado 3366, Exp. 31.

[42] AHN, Estado 3366, Exp. 31. "*Declaremos a si mismo que, aunque por las noticias de ambas cortes tenemos por muy probables todas las cosas como se anotan en la citada Carta; pero corrigiendo así mismo en que algunos de los territorio demarcados no los han andado personas que hoy vivan, y que otros entran sacados por Cartas de personas fidedignas y que los han pisado; por tal vez con poca pericia para hacer la demostración en el dibujo por lo que puede haber algunas visibles variaciones sobre el terreno así en las situaciones de los montes, como en los origines y corrientes de los ríos y aun en las denominaciones de algunos de ellos, por que sé las suelen dar diferentes cada Nación de Indias, o por otras casualidades*."

marking of the boundary would remain the same, as described by Articles 7, 9, 11, and 22 of the Treaty of Madrid. Article 11 is representative of the expectation, declaring that:

> At the same time as the commissioners appointed by both Crowns are marking the boundaries (*vaya señalando los limites*) across the border, they will be making the necessary observations to create a singular map of the entire border, from which will be made copies, which all have deemed necessary to create, and [the copies] will [then] be held by the two courts in case in the future there arise any disputes, in which case, they will be held as authentic and demonstrating full proof [of the boundary]. And so that there may not arise the slightest doubt, the aforementioned commissioners shall seek to use the same names for each of the rivers and mountains, which have none, and they will mark all of this on the map with the greatest uniqueness [*individualidad*] possible.[43]

Thus, the construction of a clear and precise map valid at both courts was perceived as the greatest possible diplomatic solution to the centuries old contest in the region. Implicit in such a view was the belief that cartography was an exact science and as such could serve as legal evidence of sovereignty. Notably, the court map would not only create precise lines, but also create uniform toponyms, ending disagreement and confusion caused, for example, by the multiple and conflicting waterways known as the *río negro*.

The idealized vision of the boundary demarcation process advocated by governmental officials during the negotiations did not account for the challenging nature of the Amazonian terrain. The dense forest and seasonally varying face of the Amazon would not conform to governmental expectations of homogeneity and unambiguous demarcation. The effort to clearly mark lines in the forest was misguided – if not naïve – from its beginning. It is to the fate of the mapping effort that this chapter will now turn.

[43] "Tratado entre las dos Coronas de España y Portugal sobre la demarcación de los Limites pertenecientes a cada una en América," AHN, Estado, 3366, Exp. 22.

The Boundary Demarcation Survey

Organizing the boundary demarcation commission proved to be a challenging enterprise. Technological and methodological differences as well as the monumental scope of the project created tension between Spanish and Portuguese geographers. Likewise, political instabilities across the two European empires consistently interrupted the work of the boundary demarcation commission. Most of the terms of the original treaty were negated by the Treaty of El Pardo (1761) and then, subsequently, restored by the Treaty of San Ildefonso (1777). The geopolitical needs of each empire on a global scale determined the shifts in policy reflected by these successive agreements. Armed resistance by colonial and indigenous populations within the contested region also affected the revision of the treaties.[44] Throughout this period of political flux, however, the dispatched geographers often simply continued their surveying efforts in the most remote regions of Ibero-America. While the first groups of geographers began their mapping in 1754, it was not until 1795 that the final portions of the survey were completed. A few imperial agents remained after 1795, with geographers occasionally emerging from the wilderness into the early nineteenth century.

Following the initial diplomatic agreement in January 1750, Portuguese and Spanish plenipotentiaries in Europe began negotiations for the establishment of two boundary demarcation commissions: one in the north to trace the Amazon, while another in the south would map the Río de la Plata.[45] Directing the methodology and oversight of

[44] For more on the Portuguese' global concerns, see Gabriel B. Paquette, *Imperial Portugal in the Age of Atlantic Revolutions: the Luso-Brazilian World, c. 1770-1850* (Cambridge: Cambridge University Press, 2013), 55–56. For disputes over different cartographic visions of the region, see, e.g., Ferreira, "O Mapa das Cortes e o Tratado de Madrid"; Safier, *Measuring the New World*, 113–114.

[45] AHN, Estado, 3366, Exp. 22; Martínez Martín, "La cartografía política del Brasil colonial," 271–74.

the effort was José de Caravajal y Lancaster, for Spain, and Viscount Tomás da Silva Tellez, for Portugal. While these two figures conceptualized the mapping effort, colonial bureaucrats in America oversaw the specific problems encountered by scientific officers dispatched to their regions. Portugal placed the Northern Zone under the authority of Francisco Xavier de Mendoza Furtado, the governor of Grão-Pará and Maranhão, while Spain named José de Iturriaga as its commissioner for what it identified as its Orinoco region.[46] In the south, Gomes Freire de Andrada, the governor of Rio de Janeiro, represented Portuguese interests, while Gaspar Munive, marqués de Valdelirios, led Spanish claims in the Banda Oriental.[47] Three groups of officers were dispatched to each zone, with each group consisting of both Spanish and Portuguese geographers. By and large, Spain named naval officers as its representatives to the boundary demarcation commission, while the Portuguese officials were predominantly military engineers.[48] The selection of individuals from these officer corps reflected where each nation had institutionalized geographical education most effectively.

During these surveys, the geographers would be forced to balance a number of conflicting geographical visions. These can be reduced to three dichotomies: Creole and indigenous conceptions of the space, Spanish and Portuguese ideas of what constituted a proper boundary, and European and American conceptualizations about the stability of the landscape. Thus, a major component of the boundary effort entailed reconciling these

[46] José de Iturriaga y Aguirre (1699-1767) shared much in common with other figures described by this dissertation. A naval officer, Iturriaga earned his wealth exporting cacao from Venezuela as part of the Real Compañía Guipuzcoana de Caracas. Following his service to the boundary demarcation commission, Iturriaga served as *Comandante general* to the new settlements of Orinoco.

[47] Gaspar de Munive León Garabito Tello y Espinosa (1711-1793) was a Creole merchant and colonial noble, born in Lima and educated at the Colegio Real de San Martín. His close ties to the Society of Jesus were severed by his role in the Guaraní Wars. Following his relocation to Madrid to serve in Charles III's court, Munive was an early member of the Real Sociedad Económica Matritense de Amigos del País.

[48] Martínez Martín, "La cartografía política del Brasil colonial," 271.

visions by making borders that were intelligible to all parties, conformed to the cultural practices of both empires, and achieved permanence in the evolving environs. An additional concern is made clear by the diaries of geographers that have been preserved amongst the ministerial papers in Madrid: how to engage neglected subjects residing in settlements omitted from the cartographic and administrative record. Francisco Plequona, for example, notes in his 1782 diary that he located two settlements that did not exist on the maps he carried with him.[49] In these settlements and elsewhere in the wilderness, Plequona notes that he encountered "*vasallos del Rey*" who were unaware of the name or status of their monarch. While such examples make for fun reading, they are also representative of the challenges geographers faced in balancing the geographic perceptions of human populations in these remote regions of Ibero-America with their duties to European ministers overseeing global empires.

With the instantiation of the boundary demarcation commission, the observational methodology that the binational geographic parties would adopt began to be clarified in late 1750. The official instructions indicated that the primary responsibilities of the observational parties would be to identify locations along the boundary on a longitudinal and latitudinal grid, and to deliver notices of changes in sovereignty to colonial governors.[50] Along with the coordinate values, observers were told to record the time of astronomical noon (to be used to calculate longitude) and all other geographic and astronomical measurements taken (such as azimuths, vertical measures, celestial and

[49] Francisco Plequona ,"Diario del viaje al Yapura para su reconocimiento por las dos partidas de sus majestades católica y fidelísima destinadas para la demarcación de Limites entre las dos Coronas," (1 August 1782). AHN, Estado 3386, Exp. 7.

[50] "Instrucciones firmadas en Madrid el día 17 de Enero de 1751 por los Ministro Plenipotenciarios de SS MM Católica, y Fidelísima para los Comisario, que debía hacer la Demarcación de Limites de una, y otra Corona por el Río de la Plata," AHN, Estado, 3366, Exp. 29.

magnetic declinations, barometric pressure, and interior angles of the triangulations). Additionally, the geographers were obligated to measure not only the boundary but also the surrounding areas, and to draft field sketches according to the quickest-yet-most accurate methods possible. It was expected, however, that geographers would create at least two sketch maps per day.[51] Geographers were meant to

> point out the directions and distances of the route and the natural qualities of the country, the inhabitants and their costumes; the animals, plants, fruits, [and] other products; the rivers, lakes, and mountains along with other [aspects] worthy of knowing; giving common names agreed upon [by both Spanish and Portuguese officials] to those [landmarks] which do not have a name so that they may be declared on the map with total clarity. And they will advance in their work, not only to be exact in the drawing and mapping of the country, but also to help through their observations the advancement of the sciences of natural history, physics, and astronomy.[52]

These were the responsibilities of the geographers, as dictated by government ministers. Naturally, agents dispatched to the field also brought methodologies to this effort learned during their technical education. As previously stated, the Spanish geographers who participated in the boundary demarcation commission were predominantly naval officers. These officers received a rigorous scientific education in the "modern philosophy" including navigation, mathematics, and basic surveying at one of Spain's naval and technical academies. Heavily influenced by the publications of the Abbé Nicolas Louis de Lacaille, Ferdinand Berthoud, the Cassinis of France, as well as Isaac Newton and René Descartes, the libraries of the naval academies were filled with a mixture of works from

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[51] AHN, Estado, 3366, Exp. 29, Art. 30.

[52] AHN, Estado, 3366, Exp. 29. "*Articulo 25. En la sobre dicha ordenanza incluirán los capítulos siguientes: que los comisario geógrafos y demás personas inteligentes de cada tropa vayan apuntando los rumbos y distancias de la derrota y la calidades naturales el país, los habitadores y sus costumbres, los animales, plantas, frutos, otras producciones, los ríos, lagunas, y montes con las demás circunstancias dignas de saberse, poniendo nombres de común acuerdo a las que no le tengan para que vengan declarados en los mapas con toda distinción. Y procuran que su trabajo, no solo sea exacto por lo tocante halaría y geografía del país, sino también provechoso por lo que mira al adelantamiento de las ciencias a la historia natural y a las observaciones físicas y astronómicas"*

leading figures of the age.[53] At the Academy of Naval Cadets in Cádiz and the adjacent Royal Observatory, the center of scientific education in the Spanish navy, the library was specifically designed to promote further individual study of higher mathematics, modern navigation, geography, and other sciences.[54] Finally, the boundary demarcation surveying parties were to be sent, in theory, with identical instructions for how to carry out their surveying mission. In practice, however, Spanish surveyors were sometimes instructed to dedicate as much effort to the covert study of both colonial subjects and their Portuguese counterparts as to the measurement of the terrain.[55]

The consultation of both texts and maps in the field was an important part of the methodology of the surveyors. Francisco Plequona notes that as part of his preparation for the surveying mission he read the works of Cristobal de Acuña, Charles Marie de La

[53] An inventory of books purchased for the library in Ferrol for 1786 lists works by Cassini, Belidor, Diderot's *Encyclopedie*, Remy, Berthelót, Lacaille, Gravesande, Berthoud, Clairaut, Benjamin Franklin, Maupertuis, D'Alembert, Newton, Descartes, Anderson, and over a dozen translations of Euclid's *Elements*: "Noticia de los compras de libros e instrumentos hechas en la Compañia y Academia de Caballeros Guardias Marinas del Departamento del Ferrol, y del caudal invertido en ellas hasta fin de Diciembre de 1786" (Ferrol, España, December 1786), AMN Ms. 2141, doc. 14 (folio 51-56), Archivo Museo Naval. An inventory of the library at the academy in Cádiz in 1789 noted atlases published in France, England and Spain; dictionaries from these nations, the published voyages of Cook, Jorge Juan, Byron, Bougainville, and Drake; the journals and published papers of the Royal Society and Académie des sciences. Its works spanned publications, heavily focusing on France and England, from 1620 until the late 1770s: "Inventario de todos los muebles, instrumentos, máquinas y libros que pertenecen a la Academia de Guardias-Marinas de Departamento de Cádiz" (Isla de León, October 31, 1789), AMN Ms. 1563, doc. 12 (Folio 51-80), Archivo Museo Naval.

[54] The creation of the "scientific official" in the Spanish navy and the cartographic methodologies its officers employed will be discussed at length in Chapter Four. For more on investment in military education and the "scientific official" in the Spanish navy, see María Dolores González-Ripoll Navarro, "La Formación Académica y Práctica de Los Marinos del Siglo XVIII: Cosme de Churruca (1761-1805), un Oficial Científico," in *De la ciencia ilustrada a la ciencia romántica: actas de los II jornadas sobre "España y las Expediciones en América y Filipinas"*, ed by. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Madrid: Ed. Doce Calles, 1995), 312–323; Antonio Lafuente and José Luis Peset, "Las Academias Militares y la inversión en ciencia en la España ilustrada (1750-1760)," *Dynamis: Acta Hispanica ad Medicinae Scientiarumque Historiam Illustrandam* 2 (1982): 193–209.

[55] Conde de Floridablanca to Conde de Fernán Núñez, Aranjuez 19 April 1782. AHN, Estado 3386, Exp. 8; "Instrucciones firmadas en Madrid el día 17 de Enero de 1751 por los Ministro Plenipotenciarios de SS MM Católica, y Fidelísima para los Comisario, que debía hacer la Demarcación de Limites de una, y otra Corona por el Río de la Plata," AHN, Estado 3366, Exp. 28, 29.

Condamine, Samuel Fritz, and "the Jesuits" in order to inform his own expedition.[56] Francisco de Requena, similarly, studied previous accounts of the region and its boundaries before serving as a geographer for the boundary demarcation effort.[57] While engaged in that effort, he was sent a package containing, among other things, copies of six preliminary maps of the area he was surveying.[58] After a crown agent, such as Requena, conducted observations in the field validating the coordinates of the boundary from the preliminary maps, final diplomatic maps were prepared in Europe and then were packaged with detailed written explanations of the limits and sent to colonial bureaucrats.[59] As will be noted repeatedly in this dissertation, such repetitious practices or observational redundancies were a defining characteristic of Bourbon geographic science. These observational redundancies took time with the lengthy process acting to

[56] "Diario del viaje al Yapura para su reconocimiento por las dos partidas de sus majestades católica y fidelísima destinadas para la demarcación de Limites entre las dos Coronas," (1 August 1782). AHN, Estado 3386, Exp. 7. Acuña was a seventeenth century priest who wrote an influential descriptive geography of the region, see: Cristóbal de Acuña, *Nuevo descvbrimiento del gran rio de las Amazonas por el padre Cristóbal de Acuña … al qual fué, y se hizo por orden de Su Magestad, el año de 1639* (Madrid: Imprenta del Reyno, 1641). Plequona's reference to vague "Jesuits" could refer to any of the many members of the Society of Jesus who resided in the southern zone and conducted frequent surveys. Most likely, however, it refers to Giovanni Carbone and Domenico Capacci, two Neapolitan Jesuits who were sent to Brazil in 1729 and became known as the "*padres matemáticos*." For more on the contributions of these two figures to geography of the region, see Martínez Martín, "La cartografía política del Brasil colonial," 268–69; Ferreira, "O Mapa das Cortes e o Tratado de Madrid," 54,56, and passim. For more on the work of Padre Samuel Fritz, see: Samuel Fritz, *Journal of the Travels and Labours of Father Samuel Fritz in the River of the Amazons between 1686 and 1723* (Nendeln, Liechtenstein: Kraus Repr, 1967). The work of La Condamine has been highlighted earlier in this chapter.

[57] Francisco de Requena, *Ilustrados y bárbaros: diario de la exploración de límites al Amazonas: 1782*, ed. by Manuel Lucena Giraldo (Madrid: Alianza Editorial, 1991), 65-70.

[58] Fernán Núñez to Francisco de Requena. Lisbon, 20 June 1782. AHN, Estado 3386, Exp. 8. The package also included four nautical almanacs, copies of pages missing from a table of values previously sent, and "other items of friendship and trade."

[59] For one excellent example of such a letter, see: "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6. The maps that accompanied this letter are both attributed to Requna, himself: *Mapa de una parte del América merydional, en que su manifiestan los países perternencientes al Nuevo Reino de Granada y Capitanía General de Caracas* (1783). AHN, Mapas Planos y Dibujos [MPD] 77) and *Mapa de una gran parte de la América meridional en que se comprende el país por donde ha de correr la línea divisioria que han de trazer las quartas partidas de límites española y portuguesa* (1781) AHN, MPD 78. For an example of Portuguese geographers verifying Spanish measurements, see "Notícia do que se tem executado na demarcação de limites da América Meridional, pelo continente do Rio Grande de São Pedro, desde o dia 22 de Janeiro de 1784 em qe teve principio esta deligência," Arquivo Nacional Torre do Tombo (TT), PT/TT/CS/H/1/4/21.

create a multi-layered vision of the American space. Geographers were in conversation with their contemporaries in Spain that took months if not years to take place, were reconciling their observations of the hinterland with descriptions of the same space found in the books of their traveling library, all the while journeying through the landscape paired with Portuguese geographers who brought a different perspective to the subject, and all were often guided by indigenous people. Each of these perspectives added a layer to the geographic vision of the Ibero-American boundary. I describe this process as the practice of layered geography.

The physical, as opposed to cartographic, practices of such layering is made clear in a letter which Martín Boneo sent, presumably along with correspondence from another group of geographers headed in the opposite direction, informing José de Varela y Ulloa of his safe passage up an unnamed tributary.[60] Boneo recounts that he paused to dutifully check the coordinates of the boundary and the integrity of some stone markers signaling the line. We can assume Boneo's measurements were one set out of many for that year, were presumably reported to the boundary commission along with Portuguese reports, and added to an archive of reports dating back to the formal beginning of the boundary effort in 1751. Even then, observation of the limits from 1751 onwards only validated the informal boundaries that had been set by cultural practice and measured sporadically by passing travelers in the sixteenth and seventeenth centuries. Boneo's inspection of the stone marker proved that its location still conformed to the coordinates on the map and promised that inspection by future geographers would continue to validate its status as an accurate marker.

[60] Martín Boneo to José de Varela y Ulloa. N/L, 13 January 1791. AHN, Estado 3386, Exp. 10.

Uniting the Layers

As alluded to above, the sketch-maps produced by the boundary demarcation commission were collected and combined to create the official schematic representations of the imperial limits. Some of these took the form of larger, continental scale visions of Ibero-America along the lines of the earlier *Mapa de los dominios*, while maps sent to viceroys and other colonial bureaucrats were more focused on specific zones of sovereignty. This section will examine cartographic representations of the northern boundary alongside the diplomatic correspondence concerning the limits of the Real Audiencia de Quito, the Virreynato de Santa Fe, and the Estado del Gran-Pará and Maranhão.

The file examined here is a compendium of different documents attempting to clarify a boundary, including a letter from Francisco Requena, a translation of a Portuguese response written in March 1781 by Juan Pereira Caldas in Barcelos, Portugal,[61] a Spanish response to Caldas written by Gaspár Santistevan, and a final note signed by Requena and Josef García de Leon y Pizarro, the local administrator.[62] The first page of the letter includes a summation of the boundary conflict as reported by Francisco Requena, whose map, *Mapa de una gran parte de América Meridional* (1781), formed the cartographic evidence of the Spanish claim (see Figure 3.3 and 3.4). Requena states that he was presenting reports to Caldas as well as Lieutenant Coronel Theodosio Constantino de Chermont, when he,

> [Made a case against] the fortifications of San Carlos and San Felipe, or the San Augustín district of the governorate of Guayano in Río Negro, because they

[61] Gaspár Santistevan had in turn, translated this letter into Spanish in May of 1781 in the city of Tabatinga, in northwest Brazil. Tabatinga refers to Forte de São Francisco Xavier de Tabatinga, in the Três Fronteiras section of the Brazilian Amazon.

[62] "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6.

> suppose they belong to the Portuguese dominion by the dividing line. I have shown the opposite ([see] accompanying map). It is [shown] this way: one should not go up the Río Yapurá in order to identify the Cordillera de Montes, which stand between the Orinóco and Amazon, because these mountains were identified from the rivers entering the Yapurá from the northern route, according to the treaties of 1750 and 1777.[63]

Figure 3.3 detail from *Mapa de una gran parte de América Meridional* (1781)

In the remainder of the letter Requena explains and defends his interpretation of the boundary line. After quoting terms of the treaty at length, Requena begins to make his cartographic case, making repeated reference to the text of the 1750 and 1777 treaties as well as his attached map:

> Suppose the Cordillera is along Line AB […] then it has its base between the sources of the Ríos Negro and Yapurá. If the latter river is navigated until it joins the Cordillera, one reaches [point] C. This is in the vicinity of the missions that Spain has on the tributaries [*cabezeras*] of the Yapurá (called by them Caqueta) that serve the Franciscans of Popayan, against which it is expressly stipulated in the [mentioned] treaties and articles that the Portuguese should not travel to the Orinoco or extend into the Provinces Populated by Spain […][64]

[63] "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6, f. 1. "*cuando lo demande las fortalezas de San Carlos y San Felipe, o San Augustín del distrito de la Gobernacion de la Guayano en el Río Negro, por que las supone pertenecen a la Dominacion Portuguesa por la Linea Divisoria. Demuestrase (acompañado Mapa) lo contrario. Como asi mismo el que no se debe subir el Río Yapurá, habia encontrar por el la Cordillera de Montes que median entre los Rios Orinóco, y Amazonas; pues estos montes se han de buscar por los ríos que entren al Yapurá por el Rumbo del Norte, según los Tratados de 1750, y 1777.*"

[64] Francisco Requena to Juan Pereira Caldas. Tabatinga, 8 June 1781. "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6, f. 1v. Emphasis in original. "*Supóngase está la Cordillera según la Linea AB. Ya sin tener ningun correspondencia con la de los Andes, o ya como un derrame de ella, que tenga su principio entre los nacimientos de los Rios Negro y Yapura. Si este ultimo Rio se navega hasta junto a lo Cordillera se llegará a C. Esto es a las inmediaciones de las Misiones que posee España en las Cabezeras del Yapurá (llamado en ellas Caqueta) que sirven los Padres Franciscos de Popayan, contra lo que expresamente esta estipulado en los mismos Tratados, y Articulos, de que no deban remontar se los Portugueses hacia el Orinóco ni estenderse hacia las Provincias Pobladas por España.*"

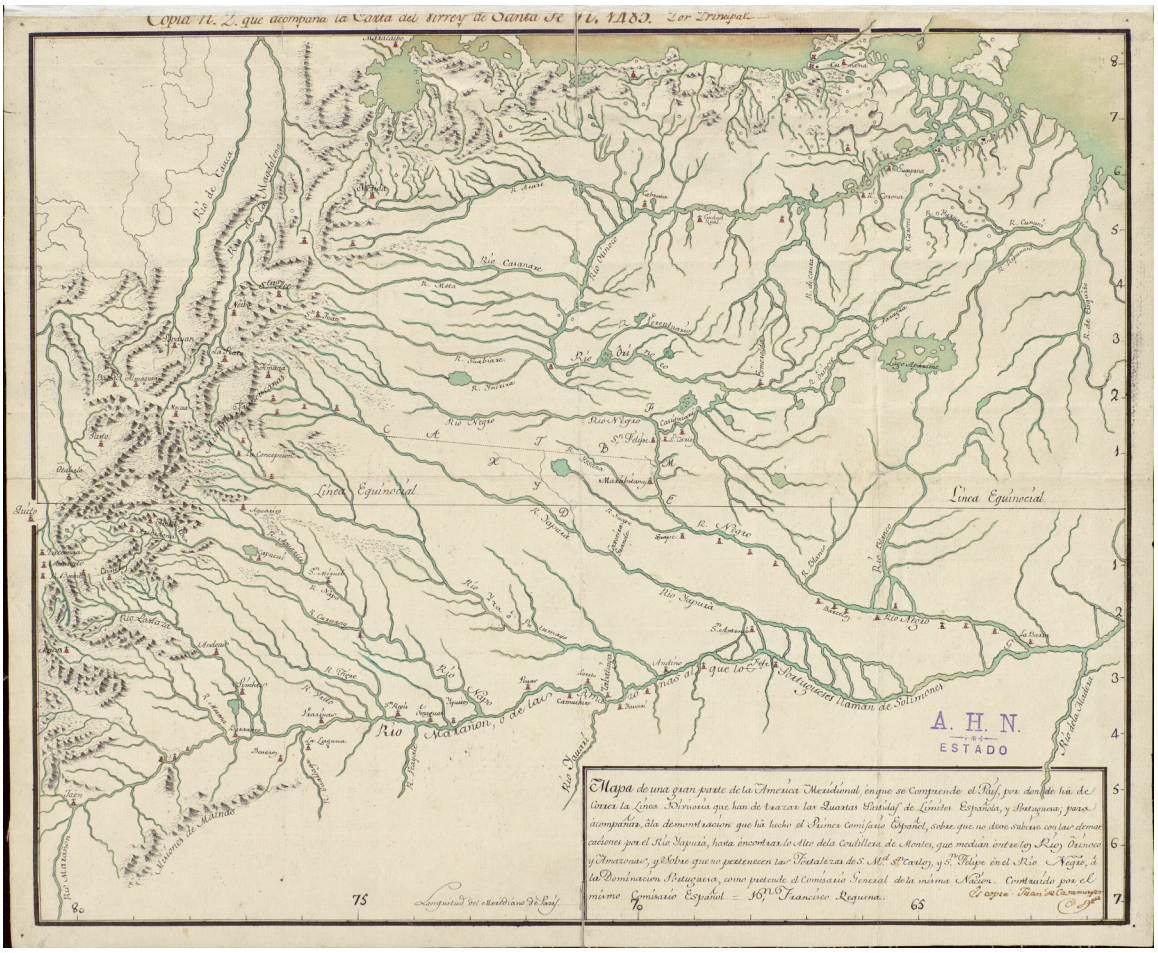

Figure 3.4 Francisco de Requena, *Mapa de una gran parte de América Meridional* (1781)

Continuing in his letter, Requena explained the difficulty commissioners faced in ascertaining the boundary line along the natural boundaries that had been codified by treaties in 1750 and 1777. The seasonal fluctuation of river height and course and their numerous tributaries made following the course of any specific river challenging. He continues "the purpose of this discussion, to achieve clarity and put things in order, is rather futile, owing to the lack of news from these countries and because there is not an exact map."[65] When documents did arrive, Requena complains that the documents were

[65] Requena to Caldas. Tabatinga, 8 June 1781. "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6, f. 3. "*El objeto de esta Discusion es bastante esteril para dar le claridad, y ponerla en órden, así por la falta de noticias de aquellos paises comó por no haber Mapa exacto de ellos.*"

full of errors.[66] Still, writing from Portugal, Juan Pereira Caldas thanked Requena for his "illustrative" letter full of "sincere and justified feelings." He further conceded that the terms of the treaty and the space it partitioned suffered from "a lack of clarity."[67]

Geographic science was the not the only means of achieving clarity for the boundary line. In fact, according to Requena, the best solution was to make a "permanent and inextinguishable marker" (*una señal permanente y inextinguible*) where the rivers diverged. Sovereignty of the area had become challenging to determine owing to the environmental changes mentioned earlier.[68] This marker would not only signal the boundary limit, but also quote the pertinent terms of the Treaty of San Ildefonso (1777) and list astronomical coordinates for the boundary line (see Figure 3.5). In a subsequent letter, Requena outlines his plans for two markers to be placed at the mouths of the Yapurá and Yavarí rivers.[69] Josef Cartagena, an artist (*dibujante*), had drawn plans for the two markers, according to Requena, but the absence of a Portuguese commissioner in the region prevented him from finalizing plans for their construction. While it is unclear if these markers were ever constructed, Requena's plan illustrates a conjoined form of Bourbon geographic practice. While Spanish geographers could measure remote locations with precision and certainty using astronomical methods, the challenges posed by the environment in some of those locations required geographers to continue to use material means to declare sovereignty. In this case, by erecting stone pillars in the middle

[66] Requena to Caldas. Tabatinga, 8 June 1781. "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6, f. 3v.

[67] Caldas to Requena. Barcelos, 28 March 1781. "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6, f. 4v.

[68] Requena to Caldas. Tabatinga, 8 June 1781. " "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6, f. 3v.

[69] Requena to Josef Garcia de Leon y Pizarro. Tabatinga, 9 June 1781. "Carta del Virrey de Santa Fe, 1785." AHN, Estado 3386, Exp. 6, f. 6-6v.

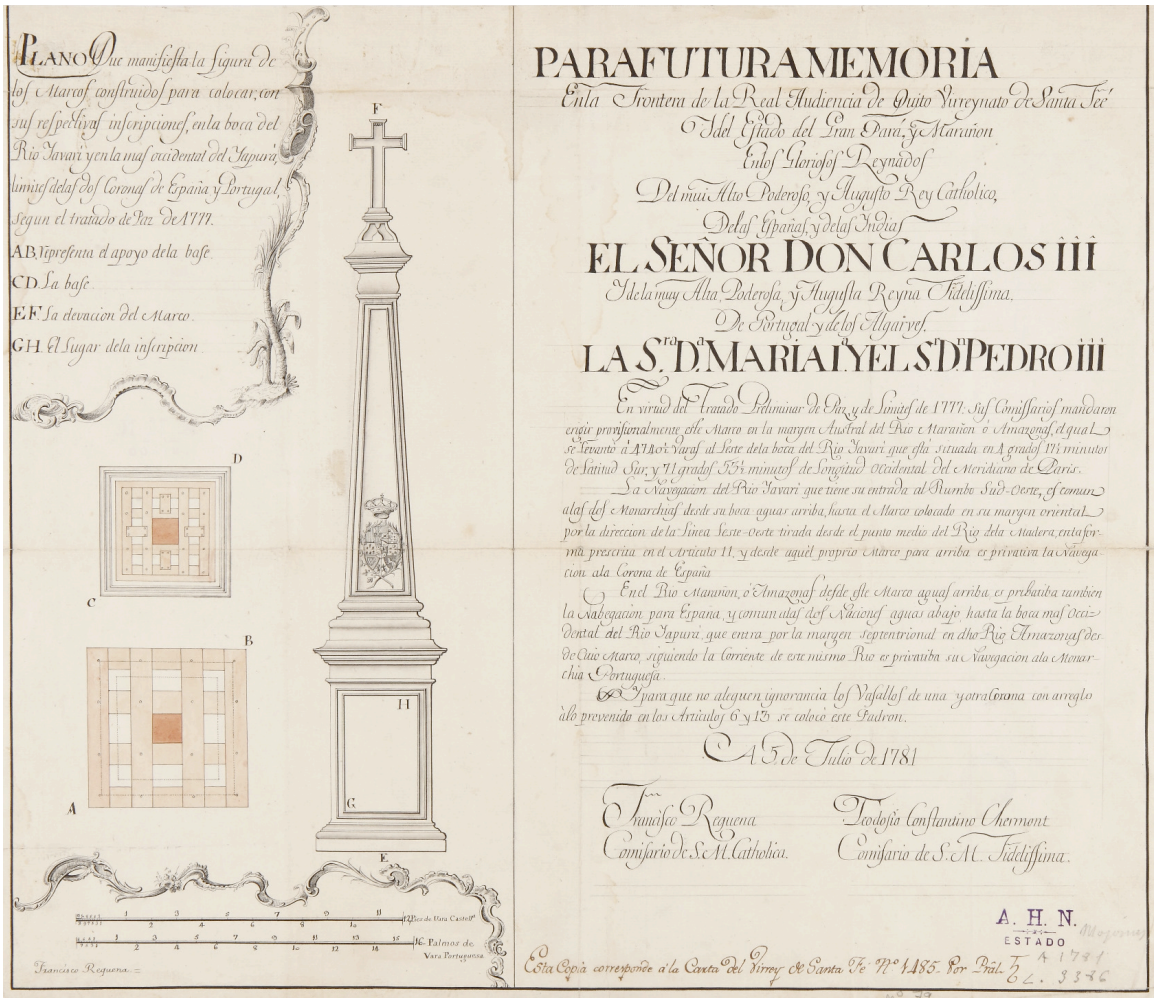

Figure 3.5 ***Monumento a Carlos III y Pedro III, Maria que significa la Paz y Tratado de Limites, 1777*** **(AHN,MPD.95)**

of the Amazon. Yet, Requena also proposed inscribing these pillars with the new, more abstract evidence that informed cartographic sovereignty: astronomical coordinates.[70]

I have argued that the Amazonian Boundary Demarcation Commission demonstrates growing acceptance within the Spanish government of cartographic images as evidentiary claims of sovereignty. This episode has shown this to be true of the Luso-Hispano boundary dividing the Orinoco from the Amazon. Francisco Requena successfully argued that cartographic evidence proved that the Portuguese surveyors were

[70] While we cannot be certain, it seems likely the two markers were constructed by 1791 when Boneo inspected some stone markers in the area, see footnote 60. The plans for these markers are preserved in AHN,MPD.94 and AHN,MPD.95.

mistaken when they demanded that Spanish settlers abandon the fortifications of San Carlos, San Felipe, and San Augustín. Requena also recognized that static maps could not be the only means of adjudicating territorial disputes in the fluid regional environment. To accommodate these seasonal changes, Requena suggested that the traditional method of declaring sovereignty – a physical marker – be used as well. The proposed pillars did not demonstrate a choice between cartographic and material proof of sovereignty. On the contrary, the pillar presented claims of sovereignty in both manners simultaneously. A minister in Europe could locate the boundary line on a map of the region, while travelers – facing the unambiguous markers separating Spanish and Portuguese territories – could locate themselves in the map using the coordinates inscribed on the pillar. This was a conjoined form of Spanish geographic practice that resolved – at least in this case – the challenges of practicing a layered geography.

Supplying the Survey

As geographers conducted their observations throughout Amazonia from the mid-eighteenth century onwards, new challenges emerged that had not been considered by the plenipotentiaries in 1750 while designing the commission's methodology. Specifically, the bureaucrats struggled to supply imperial agents with new instruments, aid agents in calibrating and recalibrating their instruments, and supply geographic parties with the latest European publications for reference during their cartographic, astronomical, and natural historical work. These problems were further exacerbated as the surveying effort stretched well in the 1770s and 1780s. Rapid development of instrumentation during this period combined with the slow process of collecting and disseminating shipments meant

that chronometers, theodolites, compasses, and reference texts could be considered archaic technologies by the time they reached agents in port cities.

Challenges to the completion of the boundary demarcation surveys came not only from imperial politics or technological innovation, but also from personalities at every level of the imperial machine. The many colonial bureaucrats who were empowered by the two monarchies to control the movement of people and goods through vast, ill-defined territories posed challenges to the supply chain attempting to reach agents in the field. To resolve issues arising from the exercise of territorial control by such bureaucrats, a trail of notarized rights and permissions accompanied each shipment. As a single example, consider Carlos José Gutiérrez de los Ríos, conde de Fernán Núñez, the Spanish ambassador to Portugal, who wrote in January 1781 to Martinho de Mello e Castro, the Portuguese Secretary of State for Navy and Overseas Colonies, to coordinate the transportation of a shipment of instruments to surveyors in the Amazon.[71] The shipment, containing four collections of "physical, astronomical, and mathematical instruments" for the boundary demarcation effort, was to be transported on Portuguese ships. Along with the instruments, Fernán Núñez and Mello e Castro wrote that they would include detailed and notarized instructions addressed to each viceroy that the shipment would pass before, outlining the intended destination for each item in the collection of instruments.

Late in February, Fernán Núñez wrote again regarding the shipment of instruments to America. This time he addressed his concerns to José Moñino, conde de

[71] Conde de Fernán Núñez to Mello e Castro, Lisbon 30 January 1781. AHN, Estado 3386, Exp 8.

Floridablanca.[72] He advised Floridablanca that a Spanish machinist, Luis Cobos, would soon depart from Lisbon for Rio de Janeiro aboard the frigate *San Juan Baptista* with two collections of physical and astronomical instruments, as well as a small fund for the purchase of food and supplies in America.[73] Cobos was only traveling with half of the instruments allocated for that voyage, however, as another officer, Vicente Vivas, was traveling with an identical collection to Grão-Pará.[74] The instruments Fernán Núñez lists for Floridablanca are typical given the scope of the surveying project, including quadrants, pendulums, chromatic and achromatic telescopes, and barometers.[75] These instruments reflect the comprehensive nature of the Spanish survey, which simultaneously utilized new instrumentation while testing the effect of the challenging environment of those very instruments. Fernán Núñez notes that the Portuguese would be sending their own collections along with imperial agents, but he was unsure of the destination of the Portuguese officers or their cargo.

These instruments were part of a larger collection gathered in London by Juan Jacinto Magallanes, a Portuguese astronomer living in London who was responsible for purchasing the bulk of scientific instruments sent with Spanish naval officers on late-eighteenth-century scientific expeditions.[76] The correspondence between Magallanes and Fernán Núñez highlights the challenges Spain faced in acquiring French and British instrumentation to be sent to the Americas. Part of the surveying collection mentioned in

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[72] Conde de Fernán Núñez to Conde de Floridablanca, Lisbon 20 February 1781. AHN, Estado 3386, Exp 8.

[73] Cobos was sent with "twenty boxes, sixteen of which make up two collections of physical and astronomical instruments for the demarcation of limits, and two more for each collection carrying an assortment of paper, pens, rulers, pencils, and other useful and necessary things for the Commissioners of both nations [*comisarios de dos quadrilles*]." Fernán Núñez to Floridablanca, Lisbon 20 February 1781. AHN, Estado 3386, Exp 8, f. 1.

[74] Fernán Núñez to Floridablanca, Lisbon 20 February 1781. AHN, Estado 3386, Exp 8, f. 1v.

[75] Fernán Núñez to Floridablanca, Lisbon 20 February 1781. AHN, Estado 3386, Exp 8, f. 5.

[76] Fernán Núñez to Luis Cobos, Lisbon 15 February 1781. AHN, Estado 3386, Exp 8, f. 1v.

the February 1781 letter, a series of books and maps concerning the Banda Oriental, would have to be sent to Montevideo and Buenos Aires later that year, Fernán Núñez noted, since it had not yet arrived from London.[77] By the following year, Magallanes, now in Paris, was writing to Fernán Núñez inquiring about a telescope that the former had commissioned.[78] Responding a month later, Fernán Núñez appears unsure of the missing telescope's ultimate fate.[79] Then, and perhaps as a response, Magallanes writes eight days later from London alerting him about the remission of a shipment of two boxes containing new books and four achromatic telescopes.[80] Magallanes was eventually paid, even if his telescope was never found, as later that summer Fernán Núñez wrote to Alfonso Egunio enclosing payments for both Egunio and Magallanes for the importation of "glasses" (*ojos*) and books destined for Lisbon.[81] This serial exchange of letters offers the reader a window on the constant consumption of scientific instrumentation and literature that a surveying effort of the size of the boundary demarcation commission required. Artisans such as John Arnold and Ferdinand Berthoud were continually producing new and improved chronometers, while Iberian ministers attempted to provide their agents with the latest instruments, astronomical tables, and geographic literature. Delays in shipment from agents, such as Magallanes, or on the travel from Iberian to American ports, meant that instrument makers in Europe might craft an improved version of their piece of equipment by the time shipments reached agents in port cities.

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[77] Fernán Núñez to Luis Cobos, Lisbon 15 February 1781. AHN, Estado 3386, Exp 8, f. 1v-2.

[78] Juan Jacinto Magallanes to conde de Fernán Núñez, Paris 8 April 1782. AHN, Estado 3386, Exp 8.

[79] Fernán Núñez to Magallanes, Lisbon 20 May 1782.

[80] Magallanes to Fernán Núñez, London 28 May 1782. Included in the shipment were four copies of the nautical almanac for 1782, two copies of the same for 1783, and a further four copies of the 1786 nautical almanac, and two copies of the John Talbot Dillon's notes on travel through Spain.

[81] Fernán Núñez to Alfonso Egunio. Lisbon, 20 July 1782. AHN, Estado 3386, Exp. 8.

Lastly, it must be noted that the constant shipment of instruments to the surveyors also allowed for the introduction of other scientific and technological elements to the remote regions being observed. Francisco Gonzalez, for example, wrote to request medical supplies to aid a community he had encountered.[82] The boundary demarcation commission, then, had an unintended non-geographic legacy: restoring monarchial interest in remote colonial settlements. In addition to stone pillars in the jungle and manuscript maps in Europe, increased focus by the monarchy on these peripheral communities was another important aspect of this Bourbon Reform mapping effort.

The Life of a Boundary Commission Agent

The prolonged surveying process also had a profound impact on the actors who served as part of it. The life and career of one particular Spanish geographer, Diego de Alvear y Ponce de León (1749-1830), illustrates the extended period of observation and measurement associated with the boundary demarcation effort. The demarcation of the Luso-Hispano American boundary began in 1751 and continued, with some interruptions, until 1801. Such an exhaustive project strained imperial resources, but it also produced unprecedented observations of some of the most remote territories in the global Spanish empire. Alvear's eighteen-year service along the Paraná and Paraguay river basins included cartographic surveys, natural historical observations, and proto-ethnographic reports.[83]

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[82] Francisco Gonzalez de la Peña to Domingo Enzina, 12 February 1795. AHN, Estado 3386, Exp. 10.

[83] For a brief biography of this figure, see Víctor Peralta Ruiz, "Diego de Alvear y Ponce de León," in *Diccionario biográfico español*, ed by. Icíar Gómez Hidalgo and Gonzalo Anes y Álvarez de Castrillón, vol. 2, 50 vols. (Madrid: Real Academia de la Historia, 2009), 803–805. For a more exhaustive study, see Sabina de Alvear y Ward, *Historia de Diego de Alvear y Ponce de Leon, brigadier de la*

Diego de Alvear y Ponce de León was born into a prominent Andalusian family just two year before the initial boundary commission was organized. He was educated in Jesuit institutions and following the expulsion of the Society of Jesus in 1767, entered into a military career. Alvear began technical studies at the *Academia de Guardiasmarinas* in Cádiz in March of 1770, where his primary instructors were Vicente Tofiño and José Varela y Ulloa.[84] Following his formative education at the academy, Alvear served on naval observational expeditions to Manila and Trinidad to determine the longitudinal coordinates of both locations utilizing new instrumentation and observational methods.

As tensions between Spain and Portugal rose in the 1770s, Alvear sailed to Montevideo where he joined naval forces preparing to defend the Río de la Plata. The Treaty of San Ildefonso was signed on October 1, 1777, ending the conflict and generating calls to re-visit the results of the earlier Ibero-American boundary commission to include changes made to it in the latest treaty. In 1778, Alvear was named to serve on the reinstated boundary demarcation commission alongside Pedro Cárdenas, Rafael Adorno, Francisco Jovellanos, and Juan Romanet. The beginning of the survey work was delayed, however, by the viceroy's protest over the number of naval officers named as commissioners.[85] Meanwhile, Juan Jacinto Magallanes was again contracted to purchase

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Armada: los servicios que prestara, los meritos que adquiriera y las obras que escribio, todo suficientemente documentado (Madrid: Imprenta de Don Luis Aguado, 1891).

[84] This institution and its scientific curriculum will be discussed in Chapter Four. Vicente Tofiño was a leading figure in Spain's scientific naval corps, overseeing the production of the *Atlas maritime de España*, and training a generation of naval officers.

[85] Peralta Ruiz, "Diego de Alvear y Ponce de León," 803; Alvear y Ward, *Historia de D. Diego de Alvear y Ponce de Leon, brigadier de la Armada*, 21–32.

new collections of instruments in London so the commission could conduct exhaustive observations in astronomy, physics, and geodesy.[86]

In 1783, following the Treaty of Versailles and developments in geopolitics, King Charles III ordered that the survey effort could begin. Late in the eighteenth century, the Río de la Plata developed into an important economic space in the Spanish empire, offering opportunity for the development of internal markets and social mobility in America through land settlement.[87] As part of such economic development and land settlement, surveying served a necessary precondition to continued growth. Djenderedjian highlights rising legal disputes between *hacendados* and indigenous communities in the 1780s.[88] These conflicts were the result of the ambiguity of land ownership and access to resource rich areas of the hinterlands. While landowners and ranchers believed the land to be unoccupied, indigenous communities claimed longstanding control of the fertile plains. Accurate map evidence of territorial occupation by either group since 1750 could have helped resolve the resulting legal contest. Instead, local governors used strong-arm tactics to clear the area of indigenous actors.

On December 23, Alvear sailed across the Río de la Plata estuary from Buenos Aires to Colonia de Sacramento along with an observational party that included geographers, astronomers, and artists.[89] There, Alvear and his team met their Portuguese

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[86] Alvear y Ward, *Historia de D. Diego de Alvear y Ponce de Leon, brigadier de la Armada*, 23–24.

[87] The importance of the unsettled hinterlands has been emphasized recently, see Julio Djenderedjian, "Roots of Revolution: Frontier Settlement Policy and the Emergence of New Spaces of Power in the Río de la Plata Borderlands, 1777-1810," trans by. Jane Ramírez, *Hispanic American Historical Review* 88, no. 4 (November 2008): 641–645.

[88] Ibid., 650–653.

[89] My synopsis is based upon the testimony of Diego de Alvear on his service in the boundary commission, see Diego de Alvear to Marqués de la Paz. Aranjuez, 8 May 1806. AHN, Estado 3386, Exp. 11, Doc. 4; "Expediente sobre las solicitudes del Capitán de Navío Don Diego Alvear para abono de

colleagues, who were led by Juan Francisco Roscio. In Colonia, Alvear and Josef Maria Cabrer, a member of the Portuguese corps of military engineers, collected all the maps, diaries, and astronomical observations detailing their assigned zone in order to update [*limpiar*] the maps during the commission effort. From Colonia, the observational party proceeded along the Paraná river basin, measuring the Río Igatimí. At the end of 1784, the observational party had begun work near Lake Merín. For two years the team moved slowly farther along the Paraná and its tributaries, taking observations of the Tacuarí and Yaguarón rivers. From 1787 until 1791, Alvear and his colleagues labored near two other tributary rivers feeding the Paraná – the Misiones and Pepirí. In 1791, however, diplomatic tensions forced an indefinite break in the demarcation expedition. This was not the first instance in which surveying efforts were interrupted. Alvear later recounted the huge costs – monetary and human – of this long expedition. However, each time the survey was nearing completion, he told ministers that he had been sent back to measure new aspects of the territory that had come under discussion in Europe.[90]

After the official boundary commission was stalled in 1791, Alvear returned to the Paraná basin and undertook a solitary expedition to complete a treatise on the flora and fauna of the area.[91] During this period, he also conducted proto-ethnographic studies of the Tupi and Guaraní, learning both indigenous languages. In 1801, however, tensions between Spain and Portugal erupted into armed conflict, leaving the boundary survey

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Sueldos que gratificaciones durante el tiempo que has sido Comisario de limites en América," AHN, Estado 3386, Exp. 11, Doc.1.

[90] "Expediente sobre las solicitudes del Capitán de Navío Don Diego Alvear para abono de Sueldos que gratificaciones durante el tiempo que has sido Comisario de limites en América," AHN, Estado 3386, Exp. 11, Doc.1. Alvear claimed that a Spanish family, living along the frontier in Uruguay died during fighting at the Seven Missions Settlements.

[91] Selections of these are reproduced as Appendix 3 in Alvear y Ward, *Historia de D. Diego de Alvear y Ponce de Leon, brigadier de la Armada*, 366–375. Notable is his entry regarding *yerba mate*, classified according to reproductive organs and named in the Linnaean taxonomic system.

formally disbanded and incomplete. In Buenos Aires and then, later, in Spain, Alvear prepared his personal papers for publication, including those related to the boundary mission, his personal travel through the Province of Misiones, and a Linnaean botany of the Paraná region.[92] Sadly, only fragments of this botanical section survive. The maps produced by Alvear were not lost, however. His cartographic representations of the Paraná and Uruguay river basins were collected and bound as the *Atlas de Alvear*.[93] Additionally, a wall map produced by Alvear and José María Cabrer showing the movements of their survey party beginning in 1783 was preserved in Madrid.[94] While Alvear planned to publish the results of his survey of the Río de la Plata, only sections of his diaries were published. None of his maps were ever printed.

The rest of Diego de Alvear's life was full of tragedy and suffering.[95] He left Buenos Aires with his wife and children in 1804 aboard the *Mercedes*. The ship was stopped by a British blockade of Cádiz where Diego and his son, Carlos, who were fluent in English, served as translators for the Spanish officers. While aboard a British ship translating for the officers, another British vessel struck the *Mercedes* sinking it along with Alvear's fortune, his wife, seven children, a nephew, and five slaves. After a period

[92] Much of the extent sections were published at the turn of the century, see Diego de Alvear y Ponce de León, "Diario de la segunda partida de demarcación de límites entre los dominios de España y Portugal en la América Meridional," in *Anales de la Biblioteca Nacional de Buenos Aires*, Buenos Aires, vol. 3, 1902; vol. 4, 1904, vol. 6, 1905; vol. 9, 1908, vol. 10, 1910.

[93] Alvear y Ponce de León, Diego de. "Atlas de Alvear," Archivo General Militar, Madrid (AGMM), AT-195. The compendium contains copies of all of Alvear's sketch-maps from the commission during the period 1783-1801, plus an additional thirty choreographies of Jesuits missions.

[94] Cabrer, José María, Diego de Alvear y Ponce de León, and José Fernández Acero. *Plano reducido esférico desde el cabo de San Antonio y boca del rio de la Plata en los 36° 20' de latitud Austral hasta el Rio Tamarijo Camapoa que desagua en el Paraguay y por los 18° 58' de otra latitud: comprensivo de todos los viajes, trabajos, reconocimientos, y operaciones tramos de Demarcación, Fajas o zonas Neutrales, Rios dudosos y Terrenos en disputa de la segunda partida de limites Española del mando de su Comiso. el Capn. de Navio de la Rl. Armada D. Diego de Albear y Ponce y del Tene. Coronel del Rl. Cuerpo de Ingens. D. José Maria Cabrer desde su salida de Buenos Ayres pr. Dice. de 1783 hasta su regreso a dha. Capital por Octe. de 1801.* [Manuscript map]. 1801. AGMM, ARG-3/6.

[95] This narrative is told in an especially poignant manner in his biography, see Alvear y Ward, *Historia de D. Diego de Alvear y Ponce de Leon, brigadier de la Armada*, 104–306.

of captivity in London, during which he remarried, Alvear returned to Spain where his second marriage eventually produced seven new children. From 1807 onward he was granted military honors and titles, only to have them rescinded during Spain's political turmoil associated with monarchial instability and the Napoleonic Wars (1803-1815), only to be reinstated later. He died, suddenly, in Madrid in 1830 on a trip to witness the marriage of King Ferdinand VII.[96]

Conclusion

The Treaty of Madrid attempted to settle eighteenth century disputes generated by the fifteenth century Treaty of Tordesillas. Tensions between the Iberian nations were tied to their historic Amazonian boundary, but, no less, were also tied to their present territorial expansion in Asia, the growth of commercial trading companies to feed new markets emerging in the Atlantic and Pacific worlds, reactions to French-British imperial competition, and both Iberian nation's desires for resource-rich lands. Finally, Spain sought to ease the economic drain that stemmed from the illicit British trade out of the Portuguese port of Colonia de Sacramento in the Río de la Plata estuary.

The Spanish plenipotentiaries at the Treaty of Madrid recognized the value that maps and accurate land surveying could bring to resolving territorial disputes along the Ibero-American boundary. The planning and execution of this project also illustrates new expertise in geographic science in Spain as a result of Ensenadean reform. Reviewing the reports sent to Madrid by naval officers employed in the Boundary Demarcation Commission, Spanish ministers began to understand the unique challenges to governance posed by the Amazonian environment. Cartographic evidence allowed ministers to

[96] Peralta Ruiz, "Diego de Alvear y Ponce de León," 805.

perceive the boundary from a continental scale, while the sketch maps prepared by agents such as Francisco Requena illustrated the realty of the formerly abstract Luso-Hispanic Boundary on a local level.

While Spanish ministers succeeded in developing new geographical expertise within their naval and diplomatic corps and that expertise had been proven highly effective for statecraft between European ministers, it was markedly less effective when used by imperial agents discussing political boundaries in the field. The geographers sent by the two Iberian crowns to demarcate a permanent boundary in the Amazon struggled to complete their mission to determine the boundary with cartographic certainty. Owing to the evolving nature of the Amazon landscape, geographers began to layer empirical and textual visions of the boundary to create the perception of a static line across a fluid environment. These challenges were also met by the adoption of new practices by the geographers that combined cartographic diplomacy with more traditional methods of claiming territorial sovereignty. One proposal, forwarded by Francisco Requena, called for the Iberian crowns to use stone pillars inscribed with longitudinal and latitudinal coordinates as permanent markers of the division between their different territories. The utility of the proposed markers were their method of simultaneously presenting a physical, unambiguous claim of ownership while also providing coordinates to orient the observer to their location in the cartographic space.

The Boundary Demarcation Commission lasted from 1751 until 1801 and was most likely the longest and most expansive survey conducted until the Great Trigonometrical Survey of British India, which lasted from 1814 to 1843. It is notable not only for the rich cartographic evidence it produced, but for the lives of the geographers

who participated in its many expeditions. This chapter has used the Ibero-American boundary survey to illustrate the advancement of geographic science in Spain at this time and its growing acceptance by ministers as a tool of statecraft. Even when the challenging nature of the Amazon necessitated that Spanish minister utilize more traditional methods of demarcating sovereignty, empirical cartographic evidence was so valued at the Spanish court that agents developed a conjunction of these two methodologies.

Introduction to Part III
The Science of Geography and Caroline Reform

Following the death of Charles III in 1788, Gaspar Melchor de Jovellanos (1744-1811) paid tribute to the popular king in a speech to the Royal Economics Society (*Real Sociedad Económica de Madrid*). In many ways, however, Jovellanos's speech was not designed to praise Charles as an individual, but to praise the spirit of his reign.[1] The speech was critical of previous generations, condemning past monarchs for not sufficiently promoting scientific education. It was under Charles III, according to Jovellanos, that education in the exact science was restored. Jovellanos argued that as mathematical societies flourished, proof and empirical demonstration became central to Spanish governance, concluding that: "useful sciences, economic principles, a general spirit of enlightenment [*ilustración*]: these are what Spain will owe to the reign of Charles III."[2]

The tenor of Spanish state reform shifted slightly in 1759 when a third son of Philip V ascended to the Spanish throne following the death of his brother, Ferdinand VI. Charles III (r. 1759-1788) – whom the marqués de la Ensenada had helped secure his previous office as King of the Two Sicilies – energetically renewed the royal commitment to state reform. When Charles III ascended to the Spanish throne, he inherited a global empire teetering between finally arriving at the promise of a progressive future and falling backwards to the disorder of its perilous state under Carlos II. In Madrid, a core group of highly influential ministers surrounded Charles. These

[1] Gaspar de Jovellanos, "Elogio de Carlos Tercero: leído a la Real Sociedad Económica de Madrid por el socio D. Gaspar Melchor de Jovellanos, en la Junta plena del sábado 8 de Noviembre de 1788," in *Obras publicadas é inéditas de D. Gaspar Melchor de Jovellanos*, ed by. Candido Nocedal, vol. 1 (Madrid: M. Rivadeneyra, 1858), 311–317.

[2] Jovellanos, "Elogio de Carlos Tercero," 312.

figures, including José Moñino, conde de Floridablanca, and Pedro Rodríguez, conde de Campomanes, were predominantly university educated lawyers and not part of the landed aristocracy. The administration of Charles III also saw increased participation by highly educated Spaniards from the "peripheral" kingdoms of the peninsula, such as Basques and Navarreses. These influential ministers worked alongside public intellectuals, such as Gaspar Melchor de Jovellanos, an influential jurist and author who at this time operated outside the royal court, to guide Spanish reform toward state centralization, economic liberalization, and colonial reform.

Scholars have described the reign of Charles III as the height of the Bourbon Reform movement, highlighting the successful promotion of state science, economic liberalization, state centralization, and colonial reform during this period.[3] The Kingdom of Naples had experienced growth in geographic analysis in the early eighteenth century, including resurgence as a center of cartographic publication. It is probable, then, that the time Charles spent in Italy colored his perception of science, particularly geography, as a tool of governance.[4] As will be discussed in detail in chapters four and five, Charles pursued an agenda of reform underpinned by investment in and promotion of geographic

[3] There is an abundant literature devoted to Charles III and state reform during his reign. For one particularly good monograph on the political and economic policy under Charles III, see Gabriel B. Paquette, *Enlightenment, Governance and Reform in Spain and Its Empire, 1759-1808* (New York: Palgrave Macmillan, 2008). See, as well, Richard Herr, *The Eighteenth-Century Revolution in Spain* (Princeton: Princeton University Press, 1958); John Lynch, *Bourbon Spain, 1700-1808* (Oxford, UK: B. Blackwell, 1989), 247-328. For state science under Charles III, see Manuel Sellés, José Luis Peset, and Antonio Lafuente, eds., *Carlos III y la ciencia de la ilustración* (Madrid: Alianza Editorial, 1988); Manuel Lucena Salmoral, "Las expediciones científicas en la época de Carlos III (1759-1788)," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed by. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 49–63.

[4] For more on the use of geography in eighteenth century Naples, see Barbara Naddeo, "A Cosmopolitan in the Provinces: G. M. Galanti, Geography, and Enlightenment Europe." *Modern Intellectual History* 10, no. 01 (2013): 1–26; John A. Marino, "Administrative Mapping in the Italian States." In *Monarchs, Ministers and Maps: The Emergence of Cartography as a Tool of Government in Early Modern Europe*, edited by James Akerman and David Buissert (Chicago: University of Chicago Press, 1992), 22-23.

science. The demand for geographic knowledge increased as military and diplomatic tensions in the Atlantic and Pacific worlds added to long-standing European boundary discussions. From his throne in Naples, the future Charles III of Spain had been a vocal critic of the Treaty of Madrid (1750) because of the extensive territorial cost to Spain.[5] As King of Spain, Charles reversed the treaty in 1761 with the Treaty of El Pardo, which returned the Ibero-American boundary in the Amazon to its previous limits, and then changed course again in 1777 with the first Treaty of San Ildefonso, which reinstated the majority of the conditions established in 1750. It was during the reign of Charles III that Spain intensified its policy of clarifying boundaries and strengthening territorial claims using geographic science, most often cartographic material.

The story of Caroline reform is well known, but it must be made clear that in addition to religious, political, legal, and economic agendas, Charles and his ministers also pursued geographic reform. Facing internal and external challenges to royal authority, these geographic reforms aimed to solidify Spanish territorial claims and encourage nationalist sentiment in Spaniards across the peninsula and colonies. Foremost among the concerns of Caroline reformers was the project of state centralization, commenced by Philip V during the first decade of the eighteenth century. Caroline ministers continued the process of combining fractured regional systems of taxation, governance, and defense to bring these reforms to the colonies. This included centralizing state and colonial bureaucracy, creating a national flag, and suppressing lingering administrative elements of the Habsburg 'composite monarchy.'[6] From the halls of state

[5] John Lynch, *Bourbon Spain, 1700-1808* (Oxford, UK: B. Blackwell, 1989), 182.

[6] This period also saw the development of Madrid to a standard befitting its status as a European capital city, including the construction of new royal roads connecting the city to other major hubs on the peninsula. In Madrid, developments included the constructions a modern sewage system, street paving and

institutions in Madrid emanated the strong arm of a global monarchy, which sought to consolidate bureaucracy to one body and speak to its global citizenry with one voice. As Charles and his ministers attempted to curb internal dissent and foreign encroachment in the Ibero-Atlantic nexus, centralization was of paramount interest to their government. Geographic reform pursued the ideology of a unified monarchy, a singular Spain. One consequence of this ideology would be a shift in imperial policy from regarding Spanish America as a group of federated kingdoms to a policy that regarded Spanish America as a colonial bureaucracy. There were, however, those who opposed state centralization as the best means of retaining the American colonies in the wake of the American Revolution. Pedro Abarca de Bolea, conde de Aranda, for example, argued for the establishment of three independent kingdoms in the Americas to be matrimonially linked to the Spanish throne.[7] The move towards centralization, however, predominated. This ideology of unification led to the formation of institutional spaces that created and disseminated the new geographic vision of a uniform and unified Spanish monarchy, mostly in the form of atlases or large imperial maps.

During the reign of Charles III a new generation of ministers promoted a reform of state governance with an ethos of rationality, geographic sensibility, and quantification of various aspects of the nation. For these ministers, measuring the nation entailed exhaustively counting the size of Spain in leagues, its *ciudadanos* and *vecinos*, and its potential economic output in terms of natural resource abundance. Foremost among these

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lighting, and the construction of public spaces and monuments (such as the Puerta de Alcalá). Charles III is affectionately remembered as '*el rey alcalde*' for his leadership over the growth of Madrid.

[7] Pedro Pablo Abarca de Bolea, *Dictamen reservado que el Conde de Aranda dio al Rey sobre la independencia de las colonias inglesas* (1783); reprinted in Juan Nido y Segalerva, *Antología de las Cortes de 1879 y 1881* (Madrid: Prudencio P. de Velasco, 1912), 12-17.

projects was the promotion of geographic science, with the ultimate goal of creating accurate atlases of peninsular and colonial Spain.

Part III examines how Caroline geographic reform promoted quantification of the monarchy and created a unique and definable geographic vision, identifiable by three features: the use of pragmatic methodologies, redundancy in either observational or historical geographic methods, and a focus on peripheral regions. Chapter Four focuses on two state sanctioned projects to create atlases of the global monarchy. The first, led by the Royal Academy of History, approached geographical projects using a methodology based on historical science. The second, led by officers within the Spanish navy, relied on field observations, where surveyors applied their skills in astronomical observation to surveying. After considering these institutions and their different geographic methodologies, Chapter Five identifies some general trends in the relationship between geographical practices and Caroline policies of state reform. Chapter Five identifies how Caroline reform was driven by the collection and analysis of economic and demographic data across the global Spanish monarchy, something I refer to as a 'spirit of quantification.' Chapter Five also examines the complicated relationship between Madrid and the imperial periphery, investigating how foreign contestations of Spanish political and economic control over the periphery forced Spanish geographers to develop non-cartographic and supposedly incontestable methods of declaring sovereignty. Finally, Chapter Six examines two maps created by Spaniards as a means of petitioning the state and that depict Spain as a unified, global monarchy consistent with the ideology promoted by the reformist ministers.

Part III
Chapter Four
The Competing Institutions of Caroline Geography and their Atlas Projects

In the Prado Museum hangs a very curious portrait of Pedro de Alcántara Álvarez de Toledo y Salm Salm. Painted in 1827, it depicts Don Pedro studying a map of the Spanish peninsula during the Battle of Uclés, where he led Spanish militia against Napoleonic forces in 1809.[1] If one looks closely, however, one will notice that the map of the Spanish peninsula that Don Pedro consults is labeled in English. Were there no acceptable Spanish maps available to the Thirteenth Duke of the Infantado? In spite of the comprehensive political, economic, scientific, and social reforms of the eighteenth century, Spain had failed to produce acceptable maps of the peninsula to guide its military defense. The ambitious reform projects aimed at promoting the science of geography in Spain during the preceding century revealed insurmountable limitations of precision and accuracy inherent in the geographic methodology utilized by one of the institutions charged by Caroline ministers with guiding the reform effort.

Yet, overall, state reforms directed at improving the science of geography in Spain had been successful, and their success was noted throughout Europe. As part of a treatise describing progress in the mathematical sciences in Europe since 1789, Jean Baptiste Joseph Delambre commented that Spain had experienced the greatest progress in geography during that time.[2] He noted the efforts of Vicente Tofiño and his scientific

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[1] Vicente López Portaña, *Pedro Alcántara Álvarez de Toledo y Salm Salm, XIII duque del Infantado*, Oil on canvas, 1827, Museo Nacional del Prado (MNP) P-4406. For more on the Peninsular Wars in Spain, see: Charles J. Esdaile, *The Peninsular War: A New History* (New York: Palgrave MacMillan, 2003).

[2] Jean B. J. Delambre, *Rapport historique sur les progrès des sciences mathématiques depuis 1789, e sur leur état actuel: présenté à Sa Majesté l'Empereur et Roi, en son Conseil d'état le 6. Février 1808* (Paris: Impr. impériale, 1810), 228–230. "*C'est en Espagne, et par les soins de son Gouvernement, que la géographie a fait le plus de progrès depuis 1789. Toutes les côtes de ce royaume ont été reconnues*

enclave of naval officers in Cádiz, and praised their efforts to map the coastlines of the Iberian peninsula, chart the Canaries and Azores, and extend this work to the Americas – their greatest achievement being the voyage of Alejandro Malaspina – and to the Mediterranean to map the coasts of Syria, Egypt, and the Barbary coastline. Still, Delambre remarked, "a detailed topographic map of Spain would be the crowning achievement [*doit couronner*] of this work." What escaped Delambre, however, was that the Spanish Navy was only one of two state institutions that undertook geographic reform during the Caroline period. The Royal Academy of History had been charged to map the peninsula, while naval officers charted the peninsular coastlines and colonial peripheries. It was this institution, the Royal Academy of History, who had been responsible for placing an accurate map of peninsular Spain in Don Pedro's hands at the Battle of Uclés and they had failed.

While Caroline ministers charged two distinct institutions with fulfilling the objectives of geographic reform, these institutions served the same ministers and were evaluated according to a common set of expectations for their geographic products. The Royal Academy of History and the geographers in the Spanish Navy were expected to produce modern cartographic images, based upon empirical methodologies, which would aid ministers as they completed their ongoing projects of state reform. However, the two institutions adopted radically different interpretations of what it meant to produce an empirical map. The naval observers utilized methodologies derived from their training in astronomy and navigation, while the empiricism practiced at the Royal Academy of History was based in the new science of history and collected social-cultural facts.

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et décrites avec la plus grande exactitude par Don Vincent Tofiño [...] Une carte topographique et détaillée de l'Espagne doit couronner ces travaux."

Caroline ministers would evaluate the success of both institutions based on the expectation that empiricism in geography exclusively meant mathematical cartography.

This chapter compares the geographic projects of the Royal Academy of History and the Spanish navy in order to understand why each institution adopted its distinct approach to geography. It opens with a brief overview of the rising political importance of geographical atlases in the eighteenth century. The chapter then shows the completion of the Spanish atlas project initiated by the marqués de la Ensenada, which took the form of three projects: Tomás López's *Atlas de España*, Juan de la Cruz Cano's *Mapa Geográfico de la América Meridional*, and the historical-geographical dictionary of the Royal Academy of History. The second half of the chapter is devoted to the Spanish Navy and its geographic expeditions and focuses on curricular reform at the naval academy and its scientific and technical education of naval officers. It also describes two atlas efforts completed by naval officers: the *Atlas marítimo de España* and the *Atlas Américano*. These institutions' respective attempts to create atlases illusrates the tensions during this period of reform between innovation and continuity, empiricism and historicism, and finally, between geography as observed in the field and geography distilled from archives.

The Politics of Geographic Atlases

The second half of the eighteenth century marks an important transitional period for the political authority granted to geographic atlases.[3] While the atlas as a compendium genre of independent cartographic images had long enjoyed widespread circulation and

[3] Michael Biggs, "Putting the State on the Map: Cartography, Territory, and European State Formation," *Comparative Studies in Society and History* 41, no. 2 (1999): 383-384. "Whether made public or kept secret, a national map survey had become obligatory by the end of the eighteenth century."

popularity, the political and juridical potential of the genre was further developed during the period coinciding with the reign of Charles III of Spain. Atlases were increasingly seen as a necessary means of defining the nation as a coherent object in the wake of the Cassini mapping project in France.[4] This change in the status of geographic atlases may be attributed to two independent developments: first, the development of technologies that solved the longitude problem and allowed for the ascription of mathematical precision to remote locations, and, second, the development of new printing technologies that allowed for mass production and popular consumption of national atlases. These two developments highlight the relationship between knowledge and power, as has been explored by Joseph Rouse.[5] As technological innovation allowed for the measurement of longitude at sea and in remote colonial locales, representations of these locations were transformed on the map through the addition of exact coordinate values.[6] The façade of precision and exactness that such coordinates added to late-eighteenth-century atlases set the constituent maps apart from previous cartographic images. It must be remembered, however, that most early modern maps had contained visual reminders of precision and

[4] "The late eighteenth century thus saw the widespread appearance of cadastral mapping in Europe. What had begun as an exercise in demarcating a border and asserting administrative territorial control now led to new conceptualisations of sovereignty and territoriality. Space came to be integrally tied to territorial sovereignty and regional identity, and mapping became a key instrument in the construction of territorial nation-states. This was true at the imperial level as well as at the level of the smaller principalities." Philip D. Wolfart, "Mapping the Early Modern State: the work of Ignaz Ambros Amman, 1782-1812," *Journal of Historical Geography* 34, no. 1 (2008): 4.

[5] Joseph Rouse, *Knowledge and Power: Toward a Political Philosophy of Science* (Ithaca: Cornell University Press, 1987). While Rouse also traces how scientific knowledge arises out of power, I am more interested in how scientific knowledge produces power.

[6] The marine chronometer developed by John Harrison in 1760 vastly improved the accuracy and ease of longitudinal calculations by allowing navigators and geographers to measure longitude by comparing relative time, a methodology developed as part of the horological work of Christiaan Huygens in the late seventeenth century. For more on the problem of measuring coordinates in remote locations for mapping purposes, see: Norman J.W. Thrower, "Longitude in the Context of: Cartography," in *The Quest for Longitude: The Proceedings of the Longitude Symposium, Harvard University, Cambridge, Massachusetts, November 4-6, 1993*, ed by. William J. H Andrewes (Cambridge, Mass: Collection of Historical Scientific Instruments, Harvard University, 1996), 49–62

exactness, such as compasses, rulers, and graticules of longitude and latitude. Yet, as John Brian Harley has argued, geographic atlases gained social and political power in the eighteenth century through the standardization of their visual language.[7] An increase in domestic surveying, as well, led European actors to associate printed atlases with cadastral surveys they had witnessed. Using standardized visual language, European empires created the appearance that domestic and colonial surveys were conducted with equal precision since they were depicted in equivalent manners. European governments used the appearance of increased and refined knowledge of remote places as convincing visual reminders of their political control over the colonial realm. Spain was not an exception.

As has been already discussed in this dissertation, the creation of a nationalized cartographic image of France, under the leadership of Louis XIV, Jean Baptiste Colbert, and the Cassini family, inspired Spain and England to attempt similar mapping projects. The use of widely available commercial atlases – such as those of Herman Moll, Thomas Jeffrys, Nicolas Bellin, John Synex, and others – for diplomatic negotiation also demonstrates the power of cartography for shaping geographic visions of disputed territories.[8] By attempting to fulfill the goals of Ensenadean reform, Spanish geographic atlases of the late-eighteenth century tried to promote a standardized representation of the Spanish national space blending the approaches of France and England. Guided by Charles III and his ministers, the Spanish government forged a unique approach to state

[7] J. B. Harley, "Power and Legitimation in the English Geographical Atlases of the Eighteenth Century," in *The New Nature of Maps: Essays in the History of Cartography*, ed by. Paul Laxton (Baltimore, MD: Johns Hopkins University Press, 2001), 110–147.

[8] On the British commercial map trade, see Geoff Armitage and Ashley Baynton-Williams, *The World at Their Fingertips: Eighteenth-Century British Two-Sheet Double-Hemisphere World Maps* (Vaduz, Principality of Liechtenstein; London: Sylvia Ioannou Foundation; The British Library, 2012).

geography, entrusting two institutions to produce national atlases meant to shape domestic and foreign perceptions of Spain.

The Royal Academy of History

Although the *Catastro de Ensenada* was never completed, its emulation of the Cassini mapping project in France began the consolidation of the geographical sciences as a tool of governance in Spain.[9] Still, the *Catastro* had only managed to complete a cadastral survey of Castile. A complete peninsular survey would require an institutional setting that would train geographers, oversee the consolidation of regional data into larger maps, and produce a singular national atlas. The Royal Academy of History provided just such a setting.

Established by royal order in 1738, the Royal Academy of History recognized a "junta" of learned individuals under the title of a royal academy.[10] These original academicians were individuals who gathered at the royal library to study history, science, the fine arts, and to work together to publish a *Diccionario historico-critico universal de España*. The 1738 order proclaims that the *Diccionario universal* would promote the "common good" [*beneficio comun*] throughout Spain. Philip V and his government probably had in mind an organization similar to other European learned societies and

[9] Note that the origins of the Ordnance Survey in Great Britain are contemporaneous to the period of greatest influence by the marqués de la Ensenada, so it is unlikely that this effort influenced his early conceptualization of the national mapping efforts. In fact, Jeremy Brotton has asserted that the British effort was itself an emulation of the French project. Later developments in Great Britain were certainly recognized by Spanish officials, but they did not influence the original conceptualization of these efforts. For more on the Ordnance Survey, see Rachel Hewitt, *Map of a Nation: a Biography of the Ordnance Survey* (London: Granta, 2010); Jerry Brotton, "Nation: The Cassini Family, Map of France, 1793" in *A History of the World in Twelve Maps* (New York: Viking, 2013), 296-297.

[10] Real cédula, 17 junio 1738. Real Academia de la Historia (RAH), M-RAH 9/3595(13).

their own historical dictionary projects.[11] The members of the Royal Academy of History eventually abandoned the completion of this original dictionary, however. Yet, as the institutional home of peninsular geographic science in Caroline Spain, the Royal Academy of History continued to focus on producing a historical dictionary of Spain. Pedro Rodríguez, conde de Campomanes, proposed a *Diccionaro geográfico-histórico de España* to the academy in 1764, just after the publication of his own geographic treatise on Portugal.[12] The project was adopted, however debates over the proper methodology for the task would delay its completion until 1802.[13]

As members of the academy had worked to prepare the *Diccionario universal* throughout the eighteenth century, the methodology that members pursued illustrates state approval of a different approach to geography than the mathematical cartography of Ensenadean reform. It was geography defined by historical knowledge and biographical description, and not mathematical measurement. This approach differed substantially from the manner in which the discipline was taught at the military academies. Rejecting both the school of mathematical geography that traced its roots to Ptolemy and the descriptive school of geography born from the writings of Strabo, this historical-biographical geography might have identified Thucydides as its ancient antecedent. Its

[11] For one interpretation of the foundation of the Royal Academy of History as a encyclopedic society, see López Gómez, *Cartografía del siglo XVIII*, 7. On the importance of the historical dictionary as a genre of geographic writing, see: Richard Yeo, "Classifying the Sciences," in *The Cambridge History of Science*, ed by. Roy Porter (Cambridge: Cambridge University Press, 2003), 251.

[12] For an excellent description of the effort, see López Gómez and Manso Porto, *Cartografía del siglo XVIII*, 157-196. For the broader context of geographical dictionaries in Bourbon Spain, see Horacio Capel, "Los diccionarios geográficos de la ilustración española," *Geo-crítica: Cuadernos críticos de geografía humana* 31 (January 1981):3-49. For Campomanes' publication, see Pedro Rodríguez Campomanes, *Noticia geografica del reyno, y caminos de Portugal* (Madrid: En la Oficina de Joachin Ibarra, 1762).

[13] Real Academia de la História, *Diccionario geográfico-histórico de España, por la Real Academia de la Historia. Seccion I comprehende el Reyno de Navarra, Señorío de Vizcaya, y Provincias de Alava y Guipuzcoa. Seccion II comprende La Rioja ó toda La Provincia de Logroño y algunos pueblos de la de Burgos* (Madrid: Imprenta de la viuda de Joaquín Ibarra, 1802-1846).

methodology consisted in the collection of historical-biographical facts. We still get a glimpse of their methodology by examining the boxes of small fragments of paper, each containing a single entry for the dictionary that can be found in the archive of the Academy.[14] The information contained on these slips of papers was then combined in narrative until the image of the place under description emerged recursively from their communal testimony. One entry for Spain, for example, focuses on the linguistic roots of its toponym, particularly the Roman occupation of the region.

> Spain = *Hispania* // The name Spain clearly derives from the Latin *Hispania*, which the Romans gave to our country. If we look at its primitive origin, however, none suggests it is from Latin but instead of some Oriental language, and command you to follow the authors [who claim] that it is a corruption of the name *Span* or *sphan*. They add that *Span* means rabbit, and since Spain has an abundant population of this species, it gave the territory its distinctive name […][15]

This description sought to understand the geography of Spain by examining its history predating Roman occupation to find a fundamental truth about the fauna of the Iberian Peninsula. The other scraps of paper in this unbound collection similarly describe Spanish towns, cities, and natural landmarks. The fundamental character of each item is defined in a few sentences through the etymology of its toponym. The geographic methodology pursued by the Royal Academy of History centered on such collections of facts, inductively constructing the image of Spain through a collection of its constituent parts.

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[14] For one such collection, see "Apuntaciones para una geografía antigua y moderna," RAH, M-RAH 9/6354-56. This collection is undated, but bears signs of multiple authorship over the course of the second half of the eighteenth century as reflected by shifts in territorial boundaries and toponyms.

[15] M-RAH 9/6354-56, "*España = Hispania // El nombre España claramente se deriva del latino Hispania, que los Romanos dieron a nuestro país. Pero si atendemos a su primitivo origen, ninguno le hace latino sino de alguna de la lenguas orientales, y comándate cohibieron los autores en que es corrupción del nombre Span o Sphan. Añaden que Span significa conejo, y que por abundar España de esta especie de animales, se la dio este nombre distintivo, como si digiéra nos la 'criniarlaria'* [sic.]." Crinio (tr.) is a back-formation latin verb from crinitus, meaning to cover with hair. The author appears to be referencing a Castillian-Latin portmanteau that Spain was called the 'land of rabbits.'

Not all of these definitions were original to the academicians, however. It appears that an interest of the academy was to find every instance mentioning places is the Hispanic world, including Spanish America.[16] Across seven hundred and sixty nine scraps of paper, this compendium examines the toponyms of cities, town, rivers, harbors, and mountains across Spanish Americas. While its authorship is unidentifiable, their source material is clearly cited at the end of each definition; the most common sources are Bartolomé de las Casa (1484-1566), Francisco López de Gómara (c. 1511-1566), Andrés González de Barcia (d. 1743), Inca Garcilaso de la Vega (1539-1616), and Gonzalo Fernández de Oviedo y Valdés (1478-1557). Although undated, this collection probably dates to the late eighteenth century, owing to the presence of astronomical coordinates in some entries.[17] Entries contain descriptions of fantastic, exotic, and mythical creatures, such as giants and sea monsters, alongside empirical observations of the surrounding environment. The result is a curious collection containing sixteenth century descriptive geography reconciled with eighteenth century natural historical observations and cartographic coordinates.

Tomás López and the Atlas geográfico de España.

It appeared to Caroline ministers that the geographic project had gained a new perspective in 1776 when a Spaniard who had been educated abroad in the science of geography joined the Royal Academy of History. Following his return from Paris in 1760, Tomás López found himself in a challenging work environment. His primary

[16] For one such collection, see "Indias, geografía, cédulas que comprehenden un alfabeto entero," M-RAH 9/4164-64bis.

[17] See the concluding section of the chapter for a discussion of the Royal Academy of History's pivot towards mathematical cartography in its geographic methodology late in the eighteenth century.

patron, the marqués de la Ensenada, had been ousted, leaving the peninsular atlas project incomplete. Following the loss of secure financial backing, López began to seek new favor within the powerful elite of Madrid.[18] Yet soon after their return, Tomás López and Juan de la Cruz Cano were granted state salaries and began teaching at the fine arts academy, the Real Academia de San Fernando, no doubt sharing the skills they had gained during their nine-year apprenticeship in Paris.

In 1763, López published a short descriptive geography of the Province of Madrid accompanied by a detailed map.[19] The title page of the work continued to identify him as a royal pensioner as well as a member of the Real Academia de San Fernando. In the book, López provided few scientific details about the Province of Madrid; it is clear he had done little or no observational work in support of his geographic conclusions. The first part of the work offers notable anecdotes from the history of the region, while the final section simply lists distances from Madrid to other major cities along the major roads. Overall, the work suggests that it was intended for elite readers and was likely produced as a way to earn income. In addition to financial security, however, López was searching for new powerful supporters. He dedicated the work to Jerónimo Grimaldi, the marqués de Grimaldi, and a signatory of the Peace of Paris. (Following the dismissal of Ricardo Wall in 1763, the marqués de Grimaldi had been named the Spanish Secretary of State.)

This descriptive geography marks an important shift in Tomás López's career. He was transitioning from working solely as a governmental agent to forging an identity as

[18] For the authoritative biography of López, including his association with the Royal Academy of History, see Antonio López Gómez, *Cartografía del siglo XVIII: Tomás López en la Real Academia de la Historia* (Madrid: Real Academia de la Historia, Departamento de Cartografía y Artes Gráficas, 2006).

[19] Tomás López de Vargas Machuca, *Descripcion de la provincia de Madrid* (Madrid: Por Joachin Ibarra, 1763).

an independent geographer. López established his own cartographic studio in Madrid, publishing a large number of decorative maps during the 1760s. Yet, these maps were not designed to fulfill the Ensenadean mission of geographic governance, but, rather, they were meant as commercial products to earn López a healthy income and perhaps attract the attention of governmental ministers. Without leaving Madrid or conducting observations in the field, López expanded his focus throughout the rest of the decade and produced regional descriptive geographies for all of peninsular Spain. It seems as if López had set out to emulate both the methodology and the career trajectory of Jean Baptiste Bourguignon d'Anville.[20] Although the historiography is unclear on the exact date, either during his final years in Paris or, more likely, during this period in Madrid, Tomás López articulated a plan to edit an authoritative geographic atlas of Spain.[21] López had published an early atlas of Spain in 1757 while residing in Paris.[22] As López received private commissions to create regional maps by academicians and book publishers, each of these regional maps represented a potential piece of his planned atlas of Spain. Accordingly, *Descripcion de la provincia de Madrid* was only one publication out of dozens that López produced or to which he contributed cartographic images in the 1760s.[23] Each of these works had some connection to the ministers who had replaced

[20] For more on the career and methodology of d'Anville, see Chapter Two, pp. 101-103.

[21] See, e.g., the conflicting accounts of Carmen Liter Mayayo and Carmen Manso Porto: Carmen Líter, with Francisca Sanchis, *La obra de Tomás López: imagen cartográfica del siglo XVIII* (Madrid: Biblioteca Nacional, 2002), 10-11; and López Gómez, *Cartografía del siglo XVIII*, 101-102.

[22] Tomás López de Vargas Machuca, *Atlas geographico del reyno de España è islas adjacentes con una breve descripcion de sus provincias: dispuesto para la utilidad publica* (Hallàrase en Madrid: en casa de D. Antonio Sanz, 1757). The full title page identifies López as: "*Thomas Lopez, Pensionista de S.M. en la Corte de Paris. Dedicado al Exco. S. D. Jaime Massones de Lima y Soto-Mayor*," Líter, *La Obra De Tomás López,* 520.

[23] For an exhaustive study of the cartographic production of Tómas López, see Líter, *La obra de Tomás López*; López Gómez, *Cartografía del siglo XVIII*, 102-105.

Ensenada: the marqués de Grimaldi, Pedro Rodríguez, conde de Campomanes, Ricardo Wall, and José Moñino, conde de Floridablanca.

By 1770 Tomás López's plan had succeeded and Charles III appointed him royal geographer. The title only served to confirm López's status as the premier cartographer within Spanish governmental circles. Now under the direction of Grimaldi, López produced maps of California and the Río de la Plata during the 1770s. While he never ventured to these colonial corners of the Spanish empire, the citations contained in his cartouches and private notes show that the flow of observations to governmental officials ensured that he received enough detail to create lavish cartographic images.[24] During this period, López continued to publish at a furious pace – like d'Anville had, as well – including technical treatises, thereby solidifying his status as among Spain's premier cartographers.[25] Finally, in 1776, the Royal Academy of History elected Tomás López to its membership, fulfilling in his goal of occupying a position of influence and authority.[26] López's entry to the Academy also benefited its institutional mission. In January of 1772, the conde de Campomanes had proposed that the Academy purchase a series of maps to utilize in their *Diccionaro geográfico-histórico de España*. Following his entry into the Academy, López quickly received the commission to produce maps for the publication.

[24] For examples of these works, see Tomás López de Vargas Machuca, *Plano de la Isla y Puerto de Santa Catalina situado en la America Meridional*. 1777 [AHN Estado Proc. Leg. 2842 Sig. 104]; Tomás López de Vargas Machuca, *Mapa geográfico que comprehende la Nueva Inglaterra, Nueva York, Nueva Jersey, Pensilvania, Maryland y parte de Virginia*. 1778 [CGE SG-Arm.1-90-N.79].

[25] Most notable was his 1775 technical manual, Tomás López de Vargas Machuca, *Principios geograficos, aplicados al uso de los mapas*. (Madrid: J. Ibarra, 1775).

[26] "Solicitud de ingreso y borrador del certificado de admission de Tomás López en la Real Academia de la Historia. 1776." 21 November 1776, Real Academia de Historia (RAH), Archivo Secretaría, Expediente de Tomás López; 17 December, 1776, RAH, Archivo Secretaría, Exp. López. Transcribed in López Gómez, *Cartografía del siglo XVIII*, 253.

Between 1777 and 1801, Tomás López produced seventy-seven maps for use by the academicians in their publications.[27] His sons, Juan and Tomás Mauricio, joined his cartographic studio on Calle Atocha in Madrid, assisting their father by locating reference materials, organizing plates, and overseeing technicians in the engraving process.[28] Meanwhile, Tomás López continued to participate actively in academy business, most notably serving as a cantankerous censor of geographic works.[29] He contributed to the "Sala de Geografía," which appears to have met sporadically to discuss methods for completing the academy's grand geographical-historical dictionary.[30] Throughout, López appears to have devoted his energy predominantly to his own personal project to produce an atlas of peninsular Spain.

The methodology López employed for his atlas has been alternately called "studio," "ecclesiastic," or "desk cartography."[31] This type of geographic practice is characterized by its lack of field observations, relying mostly on reusing existing coordinates along with crude sketches prepared by local residents, often parish priests. Accordingly, López privileged the empirical study of documents in Madrid to the empiricism of conducting astronomical observations in the field. The hallmark of López's

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[27] For a complete listing of these maps, see López Gómez, *Cartografía del siglo XVIII*, 109-110. For an accounting of all works of López, including works not destined for the RAH, see Carmen Líter, with Francisca Sanchis, *La obra de Tomás López: imagen cartográfica del siglo XVIII* (Madrid: Biblioteca Nacional, 2002), 15, 555-556.

[28] "Solicitud de ingreso de Juan López en la Real Academia de la Historia," RAH, Archivo Secretaría, Expediente de Juan López; Juan López to Real Academia de la Historia, 4 January 1793; Tomás López to Real Academia de la Historia, 18 December 1795; and T. López to RAH, 14 June 1796. Transcribed in López Gómez, *Cartografía del siglo XVIII*, 255-256.

[29] For López's work as censor, see López Gómez, *Cartografía del siglo XVIII*, 143-152.

[30] "Actas de la sala de Geografía," RAH ms. 11/8222

[31] Antonio López Gómez, *Cartografía del siglo XVIII: Tomás López en la Real Academia de la Historia* (Madrid: Real Academia de la Historia, Departamento de Cartografía y Artes Gráficas, 2006), 22–28. Additionally, see: C. San-Antonio-Gomez, C. Velilla, and F. Manzano-Agugliaro, "Tomas Lopez's Geographic Atlas of Spain in the Peninsular War: a methodology for determining errors," *Survey Review* 43, no. 319 (2011): 30–44; Carlos de San Antonio Gómez, Francisco Manzano Agugliara, and Miguel Ángel León Casas, "Tomás López, un cartógrafo de gabinete del siglo XVIII: fuentes y método de trabajo," in *Actas y CD* (presented at the XVII INGEGRAF - XV ADM, Seville, Spain, 2005).

methodology is his *interrogatorio*, a questionnaire López began to send to ecclesiastical and civil agents in the Spanish provinces in 1763 to solicit information for his regional maps.[32] Historians have previously described the use of similar questionnaires by cosmographers during the reign of Phillip II, documents that López appears to have consulted when writing the rubric for his own questionnaires.[33] López's early letters simply asked for a list of the towns within their congregations, including any rough sketches or crude maps that they wished to prepare. His first formal rubric expanded on this model, asking respondents to list nearby villages and landmarks, approximate intermediate distances along the regional road systems, and name any natural landmarks located nearby.[34] Revealing his historical mindset, López also requested that his sources provide "your name and circumstances, as one of those who have submitted their work to the atlas" to be cited in the prologue of his atlas.[35]

López revised his questionnaire during the 1780s, sending a general cover letter as well as attaching a fifteen point questionnaire.[36] In his cover letter, López tells the respondent that he intends to produce new maps that "exile" the "foreign maps,"

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[32] For more on López and his questionnaire, see Francisco Andújar Castillo, "El interrogatorio y el mapa de Almería de Tomás López (siglo XVIII). Una lectura histórica." *Nimbus: revista de climatología, meteorología y paisaje*, no. 29-30 (2012): 47–60; Carmen Manso Porto, "El interrogatorio de Tomás López: nueva hipótesis sobre su finalidad," in *Historia, Clima y Paisaje. Estudios Geográficos en memoria del profesor Antonio López Gómez* (Madrid: Universidad Autónoma de Madrid, 2004), 177-186.

[33] On the use of questionnaires by earlier Spanish cosmographers, see María M. Portuondo, *Secret Science Spanish Cosmography and the New World* (Chicago: University of Chicago Press, 2009), 211-223; Barbara E. Mundy, *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas* (Chicago: University of Chicago Press, 2000), 11-27; 227-229. For an argument that López consulted these records, see López Gómez and Manso Porto, *Cartografía del siglo XVIII*, 122.

[34] "Primera Carta Circular de Tomás López," transcribed in: López Gómez and Manso Porto, *Cartografía del siglo XVIII*, 125-126.

[35] Ibid. "*P.D. En el Prólogo de la obra daré quenta al público, si Vuestra Merced lo permite, su nombre y circunstancias, como uno de los que hayan concurrido con su trabajo a la obra*." A complete listing of all of López's sources has been published; see Carmen Líter and Francisca Sanchis, *Tomás López y Sus Colaboradores* (Madrid: Ministerio de Educación y Cultura, Biblioteca Nacional, 1998).

[36] "Segunda Carta Circular de Tomás López," transcribed in: López Gómez and Manso Porto, *Cartografía del siglo XVIII*, 127-128.

"descriptions," and "geographies" of Spain that contain "many errors."[37] His fifteen questions ask the respondent to reflect, in much the same manner as his first questionnaire, on the physical location of their hometown, its surrounding municipalities, and the natural landmarks inhabitants interact with regularly. Interestingly, López asked questions about the civil structure of their municipality, and the social resources avilable.

> 10th What are the fairs or markets, and the days are celebrated, what goods are traded, removed and received in exchange, from where and to where [do good flow], [what] weights and measures [are utilized], and [what] exchange companies or banking houses [operate there]?
>
> 12th What is your political and economic governance; do you have [legal rights] and have you erected a place for public education, such as a seminary, school, hospital, or house of reflection and piety?
>
> 13th Which diseases do people commonly suffer, and how are they cured? What is the number of deaths and births, in order to judge the health of the town.[38]

While his methods were empirical in the sense of gathering eyewitness data of each locale, the information López collected was insufficient to produce mathematically accurate cartographic representations of the diverse regions of Spain. Although his questionnaires solicited a current description of Spain, López also used historical maps from the sixteenth, seventeenth, and eighteenth centuries, along with civil records to inform his works. Drawing upon all available documents, including historical records at the Royal Academy of History, López refined his cartographic representations of Spain over the course of forty years. These maps were primarily based upon careful study of

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[37] Ibid. "*Por este medio discurro desterrar de los Mapas extranjeros, de las descripciones y Geografías de España, muchos errores que nos ponen: unos cautelosamente, otros ocultados nuestras produciones y ventajas para mantenernos en la ignorancia, con aprovechamiento suyo [...]"*

[38] Ibid., 128. "*10º Quáles son las ferias o mercados, y los días en que se celebran, qué géneros se comercian, extraen y reciben en cambio, de donde y para donde, sus pesos y medidas, compañías y casas de cambio. [...] 12º Quál es su Gobierno político y económico; si tiene privilegios y si erigió en favor de la enseñaza pública algún Seminario, Colegio, Hospital, Casa de recolección y piedad. 13º Las enfermedades que comunmente se padecen, y cómo se curan, número de muertos y nacidos para poder hacer juicio de la salubridad del Pueblo."*

historical records, but also included occasional references to observations collected by other state institutions, such as Floridablanca's 1787 census.

It is worth noting that members of the nobility remained very fond of the historical methodology of geography well into the eighteenth century.[39] The historical kingdoms, so closely tied to noble familial history, were being subsumed by the centralizing Bourbon state. Documenting and praising the history of Spanish society through geographical description provided noble individuals one avenue for advancing anti-reform narratives. Accordingly, this historicism might have been an attempt by aristocratic individuals to preserve the conception of a Spain that had granted their ancestors great privileges.

When Tomás López died in 1802, he had published in excess of two hundred maps of Spain, its historical kingdoms, its regions and provinces, and its ecclesiastical districts. López published an updated edition of his 1757 atlas of Spain in 1792, but never realized his ambitions of a grand atlas of Spain that would have collected his life's work.[40] López's sons, however, completed their father's work, publishing four editions of the *Atlas de geográfico de España, por Tomás López* in 1804, 1810, 1830, and 1840.[41] The geographic vision of the Spanish monarchy produced by Tomás López lacked not only the precision of scientific field observation, but, more damningly, it reinforced the

[39] For examples, see "Compendio de la Geografía de España y Portugal: precedido de algunas nociones preliminares y explicación general de la Europa: puesto por preguntas y respuestas para la diversión del Conde de Saldaña y su hermano, D. Manuel de Toledo Salm," Biblioteca Nacional de España (BNE) MSS/10776; "Colección de escritos sobre historia, genealogía, leyes, geografía y otros temas en relación con España y Portugal," BNE MSS/5822.

[40] Tomás López, *Atlas Geographico del Reyno de España, è Islas adyacentes. Con una breve descripcion de sus Provincias. Dispuesto, para la utilidad publica* (Se hallara en Madrid, calle de Atocha frente a la plazuela del Angel, No. 1, 1792).

[41] For a complete publishing history and chart detailing the inclusion of specific maps in each edition, see Carmen Líter, with Francisca Sanchis, *La obra de Tomás López: imagen cartográfica del siglo XVIII* (Madrid: Biblioteca Nacional, 2002), 529-543.

monarchial blindness to conditions at the periphery. Owing to his reliance on previous data, López focused on hinterland areas where the historical records were richest, paying little attention to what appeared to him from Madrid to be the less inhabited peripheries of the Spanish world. During a moment of state centralization, López produced a masterful bureaucratic geography of Spain. It was not the Spain of the Bourbon Reforms, however, it was a Spain quickly disappearing from the cartographic landscape. Antonio Crespo Sanz has reflected on López's resulting atlas thusly:

> His documents were useful as tools of administration and management, although they did not suffice for the planning of infrastructure, military strategy or the design of great works – as Ensenada had hoped –, as his confused coordinates caused great errors.[42]

López had adopted an empirical approach in the production of his maps, but it was a historical empiricism that undermined the effect of whatever astronomical observations he had utilized. At the Royal Academy of History and elsewhere in Madrid, Tomás López had been granted access to a wealth of historical data and also to coordinates derived from recent astronomical observations, but López understood these distinct collections of information as part of the same genre and utilized them together in the construction of his peninsular maps. The cabinet geography methodology applied by López rendered it impossible for Caroline ministers to discern whether policy decisions made from studying López's maps were based on precise locations for towns or natural landmarks in Spain.

[42] Crespo Sanz, "Los atlas de españa entre 1503 y 1810," 196. "Sus documentos eran útiles como herramientas administrativas y de gestión, aunque no servían para el trazado de infraestructuras, estrategias militares o el diseño de grandes obras - como había deseado Ensenada -, ya que lo trastocado de sus coordenadas provocaba graves errors."

Juan de la Cruz Cano and the Mapa geográfico de América Meridional (1775)

Studying geography under Jean Baptiste Bourguignon d'Anville alongside Tomás López in France had been Juan de la Cruz Cano. While López achieved professional prominence during his lifetime, Juan de la Cruz Cano faced harsh criticism when his map of Spanish America was completed in 1775. The marqués de Grimaldi had ordered Cruz Cano to produce the map in 1765. At that time, Grimaldi charged Cruz Cano with producing a topographic chart of South America based upon the field sketches and astronomical observations of a naval officer who had participated in the Amazonian boundary survey, Francisco Millau y Maravall.[43] When Cruz Cano completed his map in 1775, however, it went far beyond the scope of his original mission (see Figure 4.1).[44] Cruz Cano had utilized the methodologies he learned in France to produce a massive and detailed vision of Spanish America. Still, Caroline ministers did not universally accept Cruz Cano's final product, with some ministers claiming that Cruz Cano had used the visual authority of the map to hide its many inaccuracies and unscientific nature.

Just as had been the case for Tomás López, Juan de la Cruz Cano returned from Paris to a different Spanish government in Madrid. While López worked tirelessly to gain favor with the new political elite in Madrid and promote his peninsular atlas project, Cruz

[43] This effort was described in Chapter Three.

[44] Juan de la Cruz Cano y Olmedilla, *Mapa geográfico de América Meridional dispuesto y gravado por D. Juan de la Cruz Cano y Olmedilla, geógrafo pensionistado de S.M., individuo de la Real Academia de San Fernando, y de la Sociedad Bascongada de los Amigos del País, teniendo presentes varios Mapas y noticias originales con arreglo á Observaciones astronómicas, Año 1775* [map] 1:4,250,000. Madrid: 1775. 218 cm x 174 cm, [8 sheets of 56 cm x 88 cm.] [BNE MR/33-41/3692, BNE MV/25, JCB Cabinet G799 /1]. The Cruz Cano map has been a subject of moderate scholarly interest. For good examples, see Ken Mitchell, "Science, Giants, and Gold: Juan de la Cruz Cano y Olmedilla's Mapa Geográfico de la America Meridional," *Terrae Incognitae* 31, no. 1 (January 1, 1999): 25–41; Nuria Valverde and Antonio Lafuente, "Space Production and Spanish Imperial Geopolitics," in *Science in the Spanish and Portuguese Empires, 1500-1800*, edited by Daniela Bleichmar, Paula De Vos, Krisitin Huffine, and Kevin Sheehan, (Stanford: Stanford University Press, 2009), 198–215; José Andrés Jiménez Garcés, "El mapa de la América meridional (1775) de Cano y Olmedilla," in *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*, edited by Mariano Cuesta Domingo and Alfredo Surroca Carrascosa, (Madrid: Ministerio de Defensa, 2010), 218–219.

Cano had been awarded the relatively modest colonial project by the marqués de Grimaldi. As Secretary of State, the marqués de Grimaldi desired a detailed map for the

Figure 4.1 Juan de la Cruz Cano, *Mapa Geográfico de América Meridional* (Madrid, 1775)

purposes of geographic governance. Cruz Cano was simply meant to use his skills as a geographer to interpret detailed observations of the Amazonian region by Spanish agents to produce a revised representation of the physical and political situation of the Spanish colonies contested in the Treaty of Madrid (1750) and in successive boundary demarcation surveys.[45] This goal was undermined, however, by the methodology and training that Cruz Cano gained during his time in Paris in the studio of d'Anville. Unmoved by the pages of coordinate values that Spanish agents had taken in the Amazon, Cruz Cano instead began with an exhaustive study of the history of the region and its cartographic representations.

In 1797, Tomás López addressed a general debate within the Royal Academy of History on the subject of the *magnum opus* of his colleague, Juan de la Cruz Cano y Olmedilla.[46] In his defense of Cruz Cano's map, López lists some of the sources that influenced the final map, including information gathered by Jorge Juan and Antonio de Ulloa during the Spanish-French geodetic mission in 1735.[47] Cruz Cano also considered the Boundary Demarcation data and sketches from the 1750s alongside travel accounts dating to the first Spanish colonization of the Tierra Firme and Río de la Plata.[48] Additionally, during the decade he was working on the *Mapa geográfico de América Meridional*, Cruz Cano had produced a number of smaller regional maps for inclusion in

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[45] Cruz Cano to marqués de Grimaldi, 31 March 1770 in Ricardo Donoso, "El mapa de la América meridional de la Cruz Cano y Olmedilla," *Revista Chilena de Historia y Geografía* 131 (1963), 142; Cruz Cano to marqués de Grimaldi, 8 December 1767 in ibid., 141, 136; Thomas R. Smith, "Cruz Cano's Map of South America, Madrid, 1775: Its Creation, Adversities, and Rehabilitation," *Imago Mundi* 20 (1966), 55, 57; as cited by Nuria Valverde and Antonio Lafuente, "Space Production and Spanish Imperial Geopolitics," note 7.

[46] Junta Académico, 14 July 1797, RAH, Biblioteca, Varios de Indias, 9/5990, ms. f. 151-159v. Transcribed in López Gómez and Manso Porto, *Cartografía del siglo XVIII*, 265-267.

[47] Junta Académico, 14 July 1797, RAH, Biblioteca, Varios de Indias, 9/5990, ms. f. 156-156v. Transcribed in López Gómez and Manso Porto, *Cartografía del siglo XVIII*, 266-267. For more on this expedition, see Chapter One, pp. 66-70.

[48] Ibid., f.157-157v, ibid., 267.

various geographical publications by the Spanish state and Royal Academy of History.[49] Speaking in 1797 Tomás López defended the Cruz Cano map as both useful for the state and representative of his colleagues' skill as a geographer. Despite its deficits, López argued that the map was "among the best documents we have [representing] this part of the world."[50] Noting the time and financial recourses necessary to complete such a comprehensive maps, López noted that "only a sovereign can [commission such] a work or an affluent body of scholars, such as exists in few places." While Cruz Cano cited many of his sources on the *Mapa geográfico de América Meridional*, López argued it was highly likely that he consulted many more documents than are mentioned in the map.[51] López was not alone, as Francisco Requena – one of the Spaniards who had surveyed the Amazon – also defended the map in 1802.[52]

As previous scholarship has noted, the map would ultimately be attacked for its distortion of imperial space and promulgation of certain geographical myths.[53] Cruz Cano's mixture of astronomical coordinates and historical, descriptive geography angered

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[49] Nuria Valverde and Antonio Lafuente, "Space Production and Spanish Imperial Geopolitics," 201. Lafuente and Valverde use the example of a map of the Straits of Magellan that Cruz Cano produced for a translation of the travel account of John Byron's circumnavigation.

[50] Junta Académico, 14 July 1797, RAH, Biblioteca, Varios de Indias, 9/5990, ms. f. 159-159v. Transcribed in López Gómez and Manso Porto, *Cartografía del siglo XVIII*, 267. "*Finalmente concluiré diciendo que, sin embargo de los defectos que tiene este mapa, es un papel de los mejores que tenemos impresos de esta parte de la tierra; pues se emprenden pocas veces mapas de igual magnitud porque se necesita mucho tiempo para su composición, muchos documentos y asciende mucho el gasto, siendo siempre incierto el beneficio. Solamente un soberano puede hacer estas obras o un cuerpo de letrados ricos, que los hay en pocas partes. También los puede executar el brazo eclesiástico, que es poderoso y nunca muere, pero no un particular, en quien faltan las circunstancias expresadas.*"

[51] Mitchell estimates that Cruz Cano consulted over sixty maps as part of his preparation of the *Mapa geográfico de América Meridional*, while Jiménez Garcés asserts that he looked at sixty two plans from the Secretary of the Indies, countless books, and, especially, Volume Five of the atlas of Jacques Nicolas Bellin: Ken Mitchell, "Science, Giants, and Gold," 29; Jiménez Garcés, "El mapa de la América meridional (1775) de Cano y Olmedilla," 218.

[52] José Andrés Jiménez Garcés, "El mapa de la América meridional (1775) de Cano y Olmedilla," in *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810,* edited by Mariano Cuesta Domingo and Alfredo Surroca Carrascosa, (Madrid: Ministerio de Defensa, 2010), 218.

[53] For its distortion of imperial space, see Nuria Valverde and Antonio Lafuente, "Space Production and Spanish Imperial Geopolitics." For the promotion of geographical myths, see Ken Mitchell, "Science, Giants, and Gold."

governmental agents who distrusted his representation of the American hinterland. Which parts of the Amazon had been verified by astronomical observation and which were simply artistic flourishes? Was the representation of rivers based upon navigation surveys, or had Cruz Cano simply extended their course towards other bodies of water? Even Cruz Cano's detailed references could not answer these questions, as his sources greatly varied in their authority. These complaints arose even without considering his use of foreign accounts alongside Spanish ones. Whose image of America was being depicted, theirs or ours?

After the publication of *Mapa geográfico de América Meridional* in 1775, Cruz Cano and his family suffered economic hardships as a result of governmental rejection of his geographic vision. In 1787, he received a payment of 750 *reales* that had been approved by the conde de Floridablanca, the new Secretary of State, nearly a decade after completing his grand map.[54] In 1784, Cruz Cano briefly attempted to resurrect his career in Madrid with a letter to Antonio Valdés, the Secretary of the Navy, proposing the creation of a cartographic archive.[55] While a hydrographic depot was soon developed, Valdés appears to have never responded to the proposal submitted by Cruz Cano. When he died in 1790, it was in relative obscurity.

The *Mapa geográfico de América Meridional*, however, fared better than its creator. Despite the governmental criticism, the circulation of the Cruz Cano map speaks to its status as a beautiful image, regardless of questions surrounding its scientific accuracy. It went through at least four Spanish editions between 1775 and 1777, while

[54] Cruz to Floridablanca, 3 October 1787, as cited in Thomas R Smith, "Cruz Cano's Map of South America, Madrid, 1775: Its Creation, Adversities and Rehabilitation," *Imago Mundi* 20: 68, fn. 54.

[55] "El grabador D. Juan de la Cruz remite en 16 de noviembre de 1784 un proyecto para formar un depósito de mapas y planos para grabarlos y venderlos en benficio del estado. Con el proyecto." Juan de la Cruz to Antonio Valdes, 16 November 1784, Archivo Museo Naval (AMN), ms. 2245, doc. 4, f. 20-25.

William Faden issued a redacted and copied version of the map in Great Britain in 1799.[56]

While historians Antonio Lafuente and Nuria Valverde rightfully note that members of the navy criticized the map for marking hinterlands and coastal regions with equal certainty, I argue that the debate over the Cruz Cano map was not only about the authority of scientific observation but also the purpose of geographic science in state affairs. As argued in Chapter Three, the Amazonian space was being carefully measured during the second half of the eighteenth century. As government officials sought to solidify Spanish sovereignty in the region by removing areas of uncertainty and embracing observational precision, Cruz Cano instead attempted to assert Spanish sovereignty by invoking an unbroken chain of Spanish exploration and occupation of the region. It did not matter to Cruz Cano, as a cabinet geographer, that specific details in his historical image might be empirically or observationally unverifiable; their presence in the historical record was evidence of the larger claim of unceasing Spanish control of the land. By the late eighteenth century, however, Spanish ministers recognized the diminishing value of such claims internationally. Following the negociations of the Treaty of Utrecht, the Spanish government had attempted to adopt the principles of cartographic sovereignty. The marqués de la Ensenada had sent Spaniards to France to be taught the principals of mathematical cartography in the country that, according to Ensenada, had perfected its application to governance. The map produced by Juan de la Cruz Cano undermined this progress.

[56] Ken Mitchell, "Science, Giants, and Gold: Juan de la Cruz Cano y Olmedilla's Mapa Geográfico de la America Meridional," *Terrae Incognitae* 31, no. 1 (January 1, 1999): 30. Mitchell also claims that Thomas Jefferson was instrumental in the commissioning of a third variant of the map, but I have not found any other mention of Jefferson in relation to the Cruz Cano plates. Ibid., fn. 12.

In sum, Cruz Cano had succeeded in producing a masterful example of cabinet geography. His map of South America was detailed, annotated, and lavish. Cruz Cano had strayed from his initial charge, however, by supplementing – perhaps even supplanting – the observational data of Millau y Maravall with records from the state archives, historical evidence from the Royal Academy of History, and details found in the geographical atlas of Jacques Nicolas Bellin.

This was a depiction of the Spanish empire located not in absolute space, but along a historical axis. As the science of geography was increasingly defined as cartographic and mathematical science, locating place through longitudinal and latitudinal coordinates, the conservative methodology centered at the Royal Academy of History exemplified a different epistemological understanding of geography, based upon a scientific understanding of history. The geographic methodology of the Royal Academy of History exuded a historicism that aligns closely with the "new science" of Giambattista Vico and of other Enlightenment historians.[57] Vico opposed the reductionism of Cartesian thought, seeking complex and systematic explanations. He found his model in the history of civil society, explaining that his "new" science

> comes to be at once a history of the ideas, the customs, the deeds of mankind. From these three we shall derive the principles of the history of human nature, which we shall show to be the principles of universal history, which principles it seems hitherto to have lacked.[58]

[57] For the new historicism of Vico, see Ernst Breisach, *Historiography: Ancient, Medieval and Modern* (Chicago: University of Chicago Press, 1994), 203-205; Hayden White, "The Tropics of History: the Deep Structure of the New Science," in *Tropics of Discourse: Essays in Cultural Criticism* (Baltimore: Johns Hopkins University Press, 1985), 198-200. For more on the life, carrer, and ideas of Giambattista Vico, see Cecilia Miller, *Giambattista Vico: Imagination and Historical Knowledge* (New York: St. Martin's Press, 1993).

[58] Giambattista Vico, *Scienza nuova seconda* (1730/1744), *The New Science of Giambattista Vico*, trans. Thomas Goddard Bergin and Max Harold (Ithaca: Cornell University Press, 1984), 112.

Mathematical cartography in contrast was based in the practice of collecting observations of astronomical coordinates to construct the exact image of a space. The historicist geography of the Royal Academy of History, however, regarded these same data points as meaningless without their historical context. López and Cruz Cano did not represent imperial space through mathematical coordinates alone, but in the framework of society and culture. Giambattista Vico had described such an approach in his autobiography, writing that he had discovered "new historical principles of geography and chronology, the two eyes of history, and thence the principles of universal history hitherto lacking."[59] This understanding of geography explains the purpose of López's questionnaires; it was why Cruz Cano had weighed information from different historical periods and cultural contexts equally in his map of South America. The geographical products of the Royal Academy of History, Tomás López, and Juan de la Cruz Cano sought to historicize the geography of Spain.

Naval Reform and Cádiz

The other significant institutional home of geographic reform in Bourbon Spain was located in Cádiz at the *Academia de Guardias Marinas* (Academy of Naval Cadets) and associated naval observatory. As has been discussed earlier in this dissertation, naval reform began during the reign of Philip V under the leadership of José Patiño. The marqués de la Ensenada resuscitated the stalled Patiño reform program during the reign of Ferdinand VI, expanding its scope through foreign education of Spaniards and the recruitment of European artisans to assist in naval architecture and education in the naval

[59] Giambattista Vico, *Vita di Giambattista Vico scritta da se medesimo* (1725–31), *The Autobiography of Giambattista Vico with the Continuation by Villarosa* [1818], trans. Max Harold Fisch and Thomas Goddard Bergin (Ithaca: Cornell University Press, 1975), 167.

sciences. The scope of naval reform was further expanded during the reign of Charles III through increased cartographic production, the creation of a scientifically elite navy, and a series of naval expeditions focused on colonial observation.

Spain sent over twenty scientific expeditions to the Americas during the reign of Charles III.[60] These voyages were not exclusively geographic in scope, but most completed at least some cartographic projects in addition to other scientific pursuits. A select group of these scientific voyages has achieved widespread recognition by scholars, most notably the 1789-1794 voyage of Alejandro Malaspina. When historians discuss scientific voyaging during the Caroline period, they often view voyages discreetly or caricature the missions as representative of a scientific navy, state reconnaissance, or enlightened ideals. I propose instead to study these voyages as essential and representative components of a unified policy of geographic reform. Therefore, this section will draw out the intellectual and technological connections between voyages by tracing personnel and instrumentation that were common to multiple expeditions. No voyage – not even that of Malaspina – was distinct from the larger project of geographic reform. The Royal Observatory in Cádiz, and to a lesser extent its associated school, have received their due scholarly attention in the past.[61] This study does not seek to rewrite Lafuente and Sellés's excellent study, nor does it hope to make an overt challenge to their conclusions. Rather, this section seeks to contextualize geography at the naval institutions within the broader program of Bourbon reform.

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[60] For an overview of these efforts, see Manuel Lucena Salmoral, "Las expediciones científicas en la época de Carlos III (1759-1788)," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 49–63.

[61] Lafuente and Sellés, *El Observatorio de Cádiz*.

Curricular Reform at Cádiz

Writing to his colleagues in the summer of 1783, Francisco Gil y Lemos stressed the urgency of their ongoing discussions. Their aim was to reform the scientific character of the Spanish navy, beginning with a curricular reform at the naval academy in Cádiz. The first step towards their larger plan would be the training of a select corps of officers in modern nautical science. The site of their experimental program would be the naval base in Cádiz, which housed two institutions: the Royal Observatory and the Academy of Naval Cadets. Gil y Lemos pled to his colleagues that the reign of Charles III provided a unique opportunity for institutional reform that they could hardly afford to waste. Applauding the desire of the Caroline government to rapidly advance Spanish science to match the new, sophisticated European intellectual climate, Gil y Lemos reminded his colleagues that the king had recommended the navy organize their present conversation.[62]

After its founding in 1717, the Royal Academy of Naval Cadets intermittently underwent episodes focused on improving the education it offered cadets. While Phillip V and Ferdinand VI had both worked to rebuild the Spanish Navy, Charles III and his ministers faced the challenge in 1763 of rebuilding not only the physical but also the intellectual aspects of the navy. Charles commanded a sizeable fleet, but now he was in need of a new brand of officer worthy of guiding these new ships. In fact, by this time a variety of military institutions for the specialized training of officers already existed, including academies for officer training in artillery (Barcelona and Cádiz), an academy for the corps of civil guards (Madrid), a naval surgical college (Cádiz), and national

[62] Francisco Gil y Lemos, "Plan de estudios de matemáticas," 13 July 1783, Archivo Museo Naval (AMN) ms. 1563, doc. 3 (folio 5-11).

organizations for naval engineers and higher mathematics (Barcelona, Orán, Ceuta, Madrid, and Cádiz); all organized between 1730 and 1750. These schools sought to "improve the education of officers in mathematics, physics, fortification, raising of charts and artillery."[63] It would not be until 1752, with the appointment of Louis Godin (1704-1760) as director of the Academy of Naval Cadets, that the institution would begin to meet its austere charge of elevating Spain to maritime preeminence.[64] A first step towards a more modern educational program was the establishment of the Royal Observatory at Cádiz in 1753, joining the Academy of Naval Cadets that had been established some thirty-six years earlier.[65] The decade of the 1750s, marked by "economic investment in military institutions of scientific and educative character should be considered important, qualitatively different and the announcement of a new mentality."[66] This new mentality would later find great support among the advisors to Charles III after 1759.

In the mid-eighteenth century, the Crown spent nearly six hundred thousand *reales* funding Jorge Juan's purchases of the latest astronomical and surveying instruments in London.[67] The Royal Observatory in Cádiz and the Academy of Arts of

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[63] Lafuente and Peset, "Las Academias Militares y la inversión en ciencia en la España ilustrada (1750-1760)," 196.

[64] Louis Godin was a pensionary member of the Académie des sciences and leader of its 1735 expedition to measure the global meridian in Quito, which Jorge Juan and Antonio de Ulloa accompanied. Once the expedition had crossed the Andes, however, Charles Marie de la Condamine and Pierre Bouger, the other Académie members on the mission, soon superseded Godin's authority. Godin later accepted a mathematics lectureship at the University of San Marcos, Lima, before returning to Europe in 1751. Finding that in his time away his fortune had disappeared and his pensioner status in the Académie lapsed, Godin accepted the presidency of the Academy of Naval Cadets, Cádiz. For a synopsis of his life, see Seymour L. Chapin, "Godin, Louis," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008). For more about Godin's relationship to the Academy, see Antonio Lafuente and Manuel Sellés, *El Observatorio de Cádiz (1753-1831)* (Madrid: Ministerio de Defensa; Instituto de Historia y Cultura Naval, 1988), 147–160. On the expedition that Godin led, see Chapter One, pp. 66-70.

[65] Lafuente and Sellés, *El Observatorio de Cádiz*, 135–147; Lafuente and Peset, "Las Academias Militares y la inversión en ciencia en la España ilustrada (1750-1760)," 195.

[66] Lafuente and Peset, "Las Academias Militares y la inversión en ciencia en la España ilustrada (1750-1760)," 202.

[67] Ibid., 198.

San Fernando became the new cartographic centers of Bourbon Spain. The reformed curriculum at the Academy of Naval Cadets in Cádiz, while its declared purpose was teaching modern astronomy and navigation, would also contribute to geographic reform. Surveying efforts, especially of vulnerable colonial waterways, were to be the first focus of the graduates of the reformed curriculum.

The process by which early modern Europe developed new approaches for investigating nature culminated in the eighteenth century in the prominence of a new professional class of scientific traveler.[68] Beginning in the early modern period, travel to unknown territories, especially the New World, had become an important method of gaining knowledge about nature.[69] From the seventeenth century on, travel was organized and funded by one of three groups: ambitious individuals, scientific societies, or governments. Technological developments, such as John Harrison's marine chronometer, and theoretical debates, such as that over the shape of the globe, drew eighteenth-century science out into the field.[70] The possibilities wrought by this new

[68] Nicholas Dew discusses one such instance in Nicholas Dew, "Scientific travel in the Atlantic world: the French expedition to Gorée and the Antilles, 1681-1683," *British Journal for the History of Science* 43, no. 156 (2010): 1-18. Neil Safier also touches upon this class of observers, and the struggles they faced in transmitting their knowledge back to Europe, in Safier, *Measuring the New World*. A reframing of natural history into commercial botany and the rise of human geography would be one result of this effort.

[69] I use travel here to include commercial, political, and scientific trips under one heading. In the eighteenth century, the specialization of scientific voyaging divorced itself from these other forms of travel. For the development of travel and its role in knowledge production see: Harold John Cook, *Matters of Exchange: Commerce, Medicine, and Science in the Dutch Golden Age* (New Haven: Yale University Press, 2007); Dew, "Scientific travel in the Atlantic world;" R. Iliffe, "Science and Voyages of Discovery," in *The Cambridge History of Science, vol. 4: Eighteenth-Century Science*, ed. Roy Porter (Cambridge [England]: Cambridge University Press, 2003), 618-45. For a critical account of travel and travel writing, see: Mary Pratt, *Imperial Eyes: travel writing and transculturation* (New York: Routledge, 1992).

[70] John Harrison's marine chronometer made the measurement of longitude at sea possible. For a useful overview of the history of longitude see: William J. H Andrewes, ed., *The Quest for Longitude: The Proceedings of the Longitude Symposium, Harvard University, Cambridge, Massachusetts, November 4-6, 1993* (Cambridge, Mass: Collection of Historical Scientific Instruments, Harvard University, 1996). The urge to measure the shape of the earth was sparked by a disagreement between Cartesian and Newtonian hypotheses. For two views on the contribution of Charles-Marie de La Condamine's expedition to this controversy see: Safier, *Measuring the New World*; Antonio Lafuente, *Los Caballeros del Punto Fijo:*

scientific focus on field observations were, perhaps, most clearly expressed by Gil y Lemos:

> From here [the Academy at Cádiz] the most outstanding [naval officers] may leave on important commissions of this kind: the determination of longitude in various parts of the peninsula, and correcting these things, constructing accurate charts, boundary demarcation, surveying general maps of the kingdom and its provinces; and [after] growing their numbers, could be sent with similar commissions to America, so that anything relating to the positions of the seas and coasts, and acquiring comprehensive data on meteorology, climate, general winds, and other necessary precautions that leads the perfection of our navigations.[71]

In fact, the Academy of Naval Cadets was the epicenter for late-eighteenth-century Spanish scientific voyages. One immediate goal of the naval officers guiding curriculum reform was to coordinate accurate measurement of the Spanish empire.[72] Vicente Tofiño, who would teach the cadets, would lead the effort. Others naval officers contributing to the curricular reform included Miguel José Gastón, Antonio Valdes, Francisco Gil y Lemos, and José Mazarredo.

The officers promoting curricular reform hoped to elevate Spanish naval science and coordinate the measurement of the Spanish empire utilizing the latest advances in geodesy.[73] While much of the curricular debate focused on navigation and nautical science, graduates of the naval academy would utilize the same observational methodologies later when conducting geographical surveys. Miguel Joseph Gaston wrote Antonio Valdés, the recently appointed Secretary of the Navy, from Isla de León in early June 1783:

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ciencia, polítca y aventura en la expedición geodésica hispanofrancesa al virreinato del Perú en el siglo XVIII (Quito Ecuador: Ediciones ABYA-YALA, 1992). For an account of the Maupertuis expedition to Lapland and its contribution, see: Mary Terrall, *The Man Who Flattened the Earth: Maupertuis and the Sciences in the Enlightenment* (Chicago: The University of Chicago Press, 2002).

[71] Gil y Lemos, "Plan de estudios de matemáticas."

[72] Valdés to de Mazarredo and Gil y Lemos, AMN ms. 1563, doc. 2 (folio 4).

[73] Antonio Valdés to Joseph de Mazarredo and Francisco Gil y Lemos, 23 June 1783, AMN ms. 1563, doc. 2 (folio 4).

> My dear Sir: in accordance with the Royal Order of 29 May that finally approved my report on the utility that would result to [naval] service from the addition of some officers of this company [of the Royal Navy] under my command, for the study of astronomy and to practice their operations; I have ordered the director of studies, Don Vicente Tofiño, to prepare a note on the methodology that the officers sent for this business will follow in their training …[74]

Tofiño's plan of study, a brief document filling only one and a half sheets of paper, accompanied the letter. In his plan, Tofiño detailed the purpose of the navy's current project, his ideas for how it should be accomplished, and various requirements to see it completed in a timely manner. In accordance with Gaston's thoughts, Tofiño considered his charge to be:

> [to] put those officers in a state to perform those navigations that they lead, with as much accuracy and security as possible, taking advantage of those advancements which modern navigation has achieved by means of astronomy.[75]

This would require, he argued, the study of spherical trigonometry, recent advancements in the observation of longitude by using both a marine chronometer and the lunar distance method, a study of compass error and its causes, elements of common pilotage, and lessons on the construction of marine charts. Tofiño's goals included the study of such varied disciplines as theoretical and practical astronomy, hydrography, descriptive geography, cartography, and navigation.[76] Tofiño suggested that daily instruction take place at Isla de León for two hours a day. Further, two officers from the class would be sent to the Royal Observatory in Cádiz each week to "perform all observations that occur."[77] Hence, from its planning stage the curricular reform struck a balance between

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[74] Miguel Joseph Gaston to Antonio Valdés, June 13, 1783, f. 1, AMN Ms. 1563, doc. 1 (folio 1, 1v).

[75] Vincente Tofiño de San Miguel, "Método de estudios, que deben seguir los oficiales destinados a la Academia, y Observatorio del cuerpo de Guardias-Marinas del Departamento de Cádiz" (Isla de León, June 13, 1783), f. 2, AMN Ms. 1563, doc. 1 (folio 2-3).

[76] Tofiño de San Miguel, "Método de estudios, que deben seguir los oficiales destinados a la Academia, y Observatorio del cuerpo de Guardias-Marinas del Departamento de Cádiz."

[77] Ibid., 3.

theory and practice, striving to satisfy both the intellectual and operative needs of the navy. If the plan had a failing, it certainly did not lie in its ambition. Joseph de Mazarredo concurred with the boldness of Tofiño's plan, writing that if the plan were executed successfully Spain would at last "have a navy [*armada*] conforming to the dignity of its crown."[78]

Tofiño was to receive eight junior officers for the first experimental iteration of his special curriculum. However, settling on this number had been the subject of some controversy. While Miguel Gaston offered the names of four officers to join four mentioned in a previous letter, Gil y Lemos could only identify six qualified candidates from among the eligible naval officers.[79] Tofiño set the final number to balance the educational and observational aspects of his program: "It should be that the drafted [*destinados de tiro*] officials will be eight, in order to form four watches; any less would make the job of observing intolerable, and more would dampen the course of study in the academy."[80] Such a small class made this a test of the new curriculum, but it would not be the first experiment with specialized training.

The Military Society of Mathematics (*Sociedad Militar de Matemáticas*), organized in Madrid in 1757, had been comprised of a select group of military officers who balanced teaching and research using the latest scientific methodologies. Nine officers were chosen from the military branches of greatest scientific esteem. Their charge also called for the preparation of educational manuals distilled from the latest European publications. After three years, however, the group disbanded owing to

[78] Joseph de Mazarredo, "Plan de estudios", June 17, 1783, AMN Ms. 1563, doc. 5 (folio 17-21), Archivo Museo Naval.

[79] Gaston to Valdés, June 13, 1783, 1v; Gil y Lemos, "Plan de estudios de matemáticas."

[80] Tofiño de San Miguel, "Método de estudios, que deben seguir los oficiales destinados a la Academia, y Observatorio del cuerpo de Guardias-Marinas del Departamento de Cádiz," 3.

tensions between artillery officers and engineers.[81] Reformers at the Academy of Naval Cadets, seeking to avoid the fate that had befallen the Military Society of Mathematics, were deliberate in their construction of a plan that would satisfy the mission at hand without overwhelming the navy.

The flurry of letters in 1783 employs the rhetoric of bettering the nation and producing a navy worthy of its king, but a heavy undertone to these epistles is duty to the navy. Naval officers fondly remembered the Spanish tradition of maritime supremacy from centuries earlier, and shuddered at the thought of its recent decline. Further, the legacy left by Jorge Juan and Antonio de Ulloa through their involvement with the 1735 expedition to measure the global meridian set the standard by which all naval officers were measured. Following the example of Juan and Ulloa, graduates of the Cádiz academy would be expected to excel at multiple disciplines, including geographical surveying.

By September 1783, the three-page plan proposed by Tofiño had been expanded to a five-page version penned by Jacinto Cevubi.[82] The most important modification of the plan was the adoption of four volumes by Abbot Nicolas Louis de Lacaille to serve as the core of the curriculum in higher mathematics (*matemáticas sublimes*) at Cádiz.[83] This choice was met some resistance, however. Gabriel Ciscar, writing in 1785 from Cartagena, offered suggestions:

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[81] Lafuente and Peset, "Las Academias Militares y la inversión en ciencia en la España ilustrada (1750-1760)," 197–198.

[82] It is unclear who Jacinto Cevubi was, except that he penned, but most likely did not author, this document. Jacinto Cevubi, "Plan de estudios," 10 September 1783, AMN ms. 1563, doc. 6 (folio 22-24v).

[83] These volumes are presumably the following. Although, it should be noted that the order of publication dates and enumeration of volumes by Cevubi are not in agreement: Nicolas Louis de Lacaille, *Leçons élémentaires de Mathématiques* (Paris, 1741); Nicolas Louis de Lacaille, *Leçons élémentaires d'Optique* (Paris, 1750); Nicolas Louis de Lacaille, *Leçons élémentaires de Mécanique* (Paris, 1743); Nicolas Louis de Lacaille, *Leçons élémentaires d'Astronomie* (Paris, 1746).

> Thus, algebra may be well learned through [study of] Bezout; as for mechanics, to me, it does not seem wise to follow any other than Jorge Juan; optics could be learned through Smith, using either of the French translations, or better yet the Compendium done by Benito Bails in his five [books of] mathematics; and astronomy [should be studied] through La Caille.[84]

Even Gil y Lemos, a strong proponent of the plan, suggested that the curriculum should conclude with a discussion of Jorge Juan. He no doubt had in mind the summary of Jorge Juan's *Navigations* produced by Joseph de Mazarredo, who had forwarded his notes on the modern science of navigation to the group in early 1784.[85] Such eclecticism, however, was characteristic of the Academy and its reformers. In addition to the previously named volumes, the Academy's library was filled with a mixture of works from the leading figures of the age.[86] The library was designed to promote further individual study of higher mathematics, modern navigation, geography, and other sciences at the Academy of Naval Cadets and Royal Observatory. Despite these few objections, Lacaille's four volumes would prove central in the instruction the new class received. Cevubi estimated that Lacaille's volumes, which would lead the eight officers through a rigorous study of higher mathematics, would take nearly two years to master.

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[84] Gabriel Ciscar, "Plan de estudios para los oficiales agregados a la compañia de Guardias-Marinas" (Cartagena, España, 10 October 1785), f. 20v, AMN ms. 2141, doc. 10.

[85] Joseph de Mazarredo, "Breve análisis del Compendio de Navegación...", 2 January 1784, AMN Ms. 1563, doc. 9 (folio 38-41).

[86] An inventory of books purchased for the library in Ferrol for 1786 lists works by Casini, Belidor, Diderot's *Encyclopedie*, Remy, Berthelót, Lacaille, Gravesande, Berthoud, Clairaut, Benjamin Franklin, Maupertus, D'Alembert, Newton, Descartes, Anderson, and over a dozen translations of Euclid's *Elements*: "Noticia de los compras de libros e instrumentos hechas en la Compañia y Academia de Caballeros Guardias Marinas del Departamento del Ferrol, y del caudal invertido en ellas hasta fin de Diciembre de 1786" (Ferrol, España, December 1786), AMN ms. 2141, doc. 14 (folio 51-56). An inventory of the Academy's library in 1789 noted atlases published in France, England and Spain; dictionaries from these nations, the published voyages of Cook, Jorge Juan, Byron, Bougainville, and Drake; the journals and published papers of the Royal Society and Académie des sciences. Its works spanned publications, heavily focusing on France and England, from 1620 until the late 1770s: "Inventario de todos los muebles, instrumentos, máquinas y libros que pertenecen a la Academia de Guardias-Marinas de Departamento de Cádiz" (Isla de León, 31 October 1789), AMN ms. 1563, doc. 12 (Folio 51-80).

Before the officers could begin Lacaille's course, however, they were required to undergo a rapid review of the standard curriculum of the Academy of Naval Cadets. Cevubi noted that this had been suggested for two reasons: first, the obvious utility of reviewing introductory mathematical courses before entering into a more rigorous advanced course of study. Second, according to Cevubi, was "the advantage of placing them in a state where they might substitute for any of the professors by need of disease or other reason, to avoid a time where the naval cadets are without instruction."[87] Again, the currents of pragmatism ran deep amongst the Bourbon reformers.

The first of Lacaille's volumes to be covered was his *Elementary Lessons of Mathematics*.[88] The volume began with simple arithmetic but quickly progressed to sophisticated algebraic and geometric equations. This included plane and solid geometry, Cartesian algebra, conic sections, quadratics, and infinite series. The volume concluded with a course on calculus and its many applications. The plan of studies at Cádiz praised Lacaille not only for the brevity of his volume, but also for the depth of material it covered. Rather than merely extolling the various theorems, Cevubi observed, Lacaille drove the reader to derive formulas and question ideas. Cevubi's plan praised Lacaille's mathematical argumentation to be both "philosophical" and "metaphysical." Cevubi concluded that the sophistication of the volume meant that even the most prepared students would benefit from studying Lacaille.[89] The plan estimated that following their brief review of introductory mathematics, which was not to extend past February of the following year, the study of the first volume would take the balance of 1784 to complete.

[87] Cevubi, "Plan de estudios," 22v.
[88] Lacaille, *Leçons élémentaires de Mathématiques*.
[89] Cevubi, "Plan de estudios," 23.

The first four months of 1785 were to be dedicated to the study of the second and third volumes of Lacaille's course. First, the officers would study the science of optics.[90] Here they would focus not only on the laws of perspective, light, dioptrics and catoptrics, but also on the theoretical basis of the various astronomical, navigational, and surveying instruments that they would employ on their missions.[91] Following their study of optics, the officers would review Lacaille's volume on the science of mechanics.[92] Lacaille's text opens with a discussion of motion as an abstract concept, before separately exploring terrestrial, celestial, and fluid motions. The volume also contains a detailed description of elementary machines and their components. Despite the declared importance of these subjects, none of the letters circulating amidst the naval advisors reflect a great deal on either optics or mechanics except insomuch as they were clearly concerned with the application of reliable instruments for observation, the motion of water, and other practical concerns arising out of the navigational and surveying missions of the new navy.

Most, if not all, practical optical concerns would be consigned to discussion of the fourth volume of study: astronomy.[93] This volume covered matters of practice and theory, prescribing everything from the "ritual and labor" of practicing observations in the observatory, to a brief introduction of spherical trigonometry and the Newtonian laws of universal motion. Completing the fourth volume, Cevubi wrote, made it

> safe to [assume] that one will be known as an excellent astronomer admired [for] the true science, and that one will be familiar with whatever is found, observed, calculated and mixed on the land and in the sea.[94]

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[90] Lacaille, *Leçons élémentaires d'Optique*.
[91] Cevubi, "Plan de estudios," 23v.
[92] Lacaille, *Leçons élémentaires de Mécanique*.
[93] Lacaille, *Leçons élémentaires d'Astronomie*.
[94] Cevubi, "Plan de estudios," 24.

Completing their astronomical studies, it was thought, would take the officers through the end of 1785, if not longer. There was little doubt that the officers would be able to complete their task eventually, but Cevubi was clearly nervous about the time allotted by the admiralty.

> As before, Cevubi made clear the high stakes of this experimental program:
>
> > Finishing in this way their studies, with good understanding, we could say of these eight officers sine cortice nare,[95] and to take to themselves all important charges for nautical science and royal service, in the assuredness that they understand all the books of the faculty, and they will carry on gallantly [*con lucimiento*].[96]

Whatever the stakes for the institution, the expectation was that the reforms at Cádiz would reverberate on a national scale and that the success of this curriculum would produce scientists capable of advancing the interests of the crown, and thus of the nation-state, in the global scientific setting.

The curriculum debate in the summer of 1783 was not merely a pedagogical discussion; the navy possessed a very real objective: this curriculum was expected to produce officers quickly. The success of these first eight officers would, in turn, validate the continued reform of the naval academy. Something was needed to counter the great economic and political problems facing the Spanish nation as the eighteenth century waned; science, it was believed, could cure these ills. As Gabriel Ciscar observed in his notes on the proposed plan for the curriculum at Cádiz: "naval tactics, this science whose fine knowledge can bring glory to an official after a day of battle, is almost all based on

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[95] From Cicero, a proverb, meaning "to manage oneself without need of any assistance." Robert Ainsworth, *An abridgment of Ainsworth's dictionary, English and Latin, designed for the use of schools. By Thomas Morrell, D.D. Carefully cor. and improved from the last London quarto edition by John Carey, LL.* (Philadelphia, U. Hunt; New-York, J. & J. Harper; [etc., etc.], 1837), 921.

[96] Cevubi, "Plan de estudios," 24.

the principles of pure Geometry."[97] Practical and theoretical considerations were merging.

As previously noted, Spain sent twenty scientific voyages to the Americas during the reign of Charles III; the Academy of Naval Cadets contributed greatly to many of these voyages.[98] Of the twenty, eight were dispatched to the southern part of the colonies and a further three were sent to the Pacific; such was the intense focus on retaining power at the periphery of empire. In fact, seventeen of the twenty were sent to peripheral areas rather than traditional colonial centers. It was in the defensively vulnerable peripheral regions that Spain expected to find new botanical and mineral resources that could buttress its economy. Additionally, however, it was in these remote locations that Spanish identity and geographic knowledge were most scarce and the centralizing focus of the Bourbons most weak. Surveying expeditions were one way in which the Bourbon Monarchy sought to strengthen its territorial claims along the edges of empire. The military endorsed scientific voyages as a means to gain accurate maps of strategically important regions and make powerful territorial claims. Finance ministers sought to use scientific voyages to seek out new natural resources that might counteract the late eighteenth century lag in the production of chief crops and minerals. Political leaders wanted an assessment of colonial society. All these goals were perhaps secondary to the curriculum reformers at the naval academy; their focus was to educate a generation of young officers in the methods needed to completely measure the Spanish world.

While historians have tended to treat scientific voyages during the Caroline period discreetly, focusing predominantly on the expedition led by Alejandro Malaspina, or

[97] Ciscar, "Plan de estudios para los oficiales agregados a la compañia de Guardias-Marinas," 16v.
[98] For a fuller assessment of these voyages, see: Manuel Lucena Salmoral, "Las expediciones científicas en la época de Carlos III (1759-1788)."

collectively, focusing on the renewed interest of Bourbon ministers in the colonial sphere, such characterizations obscure that these voyages were a cohesive surveying program conducted by a core group of officers and using a common collection of scientific instruments. It is beyond the scope of this chapter to make an argument concerning the entirety of scientific voyaging during the Caroline period,[99] but the following section will briefly demonstrate these linkages by examining two geographic atlases: the *Atlas marítimo de España* and the *Atlas Americano*. As will be shown, these individuals utilized a common methodology and common set of instruments to map the Spanish periphery.

Atlas marítimo de España

Completed between 1787 and 1789, the *Atlas marítimo de España* served as a model for subsequent geographic reform projects conducted by naval officers.[100] Led by Vicente Tofiño, the atlas was compiled out of a series of surveying expeditions conducted by officers stationed at the Academy and Naval Observatory in Cádiz. Their meticulous observations and detailed charts, representative of the aspirations that the curriculum reformers had espoused, stand in stark contrast to the cartographic work of the Royal Academy of History described earlier in this chapter. These naval officers successfully demonstrated the potential of field observations and scientific cartography for Spanish governance.

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[99] For excellent summaries of the larger voyaging contexts, see Manuel Lucena Salmoral, "Las expediciones científicas en la época de Carlos III (1759-1788)"; María Pilar Gutiérrez Lorenzo, "Expediciones en tiempo de Carlos IV," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed by. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 65–77.

[100] Tofiño de San Miguel, Vincente. *Atlas Marítimo de España*. Madrid, 1789.

The French government contacted Spanish authorities in 1776 to seek permission for a French expedition conducting hydrographic surveys of the Mediterranean coastline to chart the Canaries during its passage around the African coast.[101] Spanish authorities gave their approval on the condition that José Varela y Ulloa, a midshipman stationed in Cádiz, accompany the French officials. In 1777, Varela y Ulloa sailed on the French vessel *Boussole*, producing excellent navigational charts of the Canaries and surrounding sections of the African coast. Reflecting on this French hydrographic work, as well as the successful voyages undertaken by British and French sailors during the first decade of his reign, King Charles III and Antonio Valdés, his naval minister, called for the construction of a "hydrographic atlas" of the coastlines of Spain.[102] The effort was entrusted to Vicente de Tofiño and his recent class of naval cadets, who were being trained in the same manner as José Varela y Ulloa had been.[103]

On May 29, 1783, a number of junior officers began the program in Cádiz. The first class included Joseph Espinoso Bello, José de Vargas Ponce, and Alejandro Belmonte. Dionisio de Alcalá-Galiano, Alejandro Malaspina, and three of Antonio de Ulloa's sons (Francisco, Antonio, & Buenaventura Ulloa) also entered the Academy in the 1780s.[104] On July 6, Vincente Tofiño took command of these officers's work and seven of the destined officers were soon "assigned on the orders of the Director of the Academy of Naval Cadets, Don Vincente Tofiño, into his commission to build marine

[101] Luis María de Salazar, *Discurso sobre los progresos y estado actual de la hidrografía en España* (Madrid: Imprenta Real, 1809), 48.

[102] Real cédula, 27 June 1783; Salazar. *Discurso sobre los progresos y estado actual de la hidrografía en España*, 49.

[103] For a complete listing of the officers sent to study under Tofiño, see "Libro de oficiales agregados a la Compañia de Guardiasmarinas de Cádiz para hazer estudios mayores y para practicar la Astronomia en su Observatorio," AMN ms. 1146.

[104] "Libro de oficiales agregados a la Compañia de Guardiasmarinas de Cádiz para hazer estudios mayores y para practicar la Astronomia en su Observatorio", 1, 1v, AMN ms. 1146. Dionisio Alcalá-Galiano entered the Academy 8 November, 1784 on orders from "el Sr. Capitan General de la Armada."

charts."[105] The group of officers studying under Tofiño continued to grow throughtout this period, as Ciriaco de Cevallos and Cosme Churruca entered the Academy on August 8, 1788 by royal order.[106]

Recalling the participation of Jorge Juan and Antonio de Ulloa in the La Condamine expedition in Peru, the architects of the curriculum at Cádiz characterized their ideal naval officer as one engaged in scientific expeditions.[107] Hydrography, further, was a discipline intimately tied to naval culture. A successful survey attuned to the precise and detailed measurement of not only the coastlines, but also the channel floor, required discipline that was unique to naval operations.[108] One facet of this rigor may be observed from the daily exercises conducted to calibrate instruments at the naval observatory.[109] In fact, some have argued that the rigor of nautical culture influenced the development of a rhythm of scientific observation found in nineteenth century observatories.[110]

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[105] "Libro de oficiales agregados a la Compañia de Guardiasmarinas de Cádiz." The records of Belmonte, Josef Espinoa Tello, Julian Canelas, Vargas Ponce, Juan Bernacci, Miguel Maria Gaston, and Jose Ortiz de Canelas all note their participation.

[106] Ibid.

[107] Vincente Tofiño de San Miguel, "Método de estudios, que deben seguir los oficiales destinados a la Academia, y Observatorio del cuerpo de Guardias-Marinas del Departamento de Cádiz" (Isla de León, June 13, 1783), Doc. 1; Doc. 3, AMN ms. 1563, doc. 1 (folio 2-3).

[108] D. Graham Burnett has noted that hydrography, as distinct from general surveying, was influenced by its naval origins in its reliance on synchronization: D. Graham Burnett, "Hydrographic Discipline among the Navigators: Charting an 'Empire of Commerce and Science' in the Nineteenth-Century Pacific," in *The Imperial Map: Cartography and the Mastery of Empire*, ed. James Akerman (Chicago: University of Chicago Press, 2009), 216.

[109] Ciriaco de Cevallos describes the synchronization efforts in Cádiz in Ciriaco de Cevallos, "Diario travajado a Borda del Paquebote Santa Eulalia por Theniente de Fragata Don Ciriaco de Cevallos en la navegacion que por los años de 1788 y 1789 hizo aquel bugue y en conserva del Santa Casilda al reconocimiento del Estrecho de Magallanes," AMN ms. 0164/001.

[110] Fabian Locher, "The Observatory, the Land-Based Ship and the Crusades: Earth Sciences in European Context, 1830-50," *The British Journal for the History of Science* 40, no. 4 (December 1, 2007): 491-504.

In June of 1783, Antonio Valdés wrote to Vicente Tofiño detailing the expectations for his hydrographic atlas project.[111] Tofiño was to perform surveys of the Canaries and African coast, making any correction needed to the charts of José Varela y Ulloa. He could choose his own men and purchase any instruments deemed necessary for

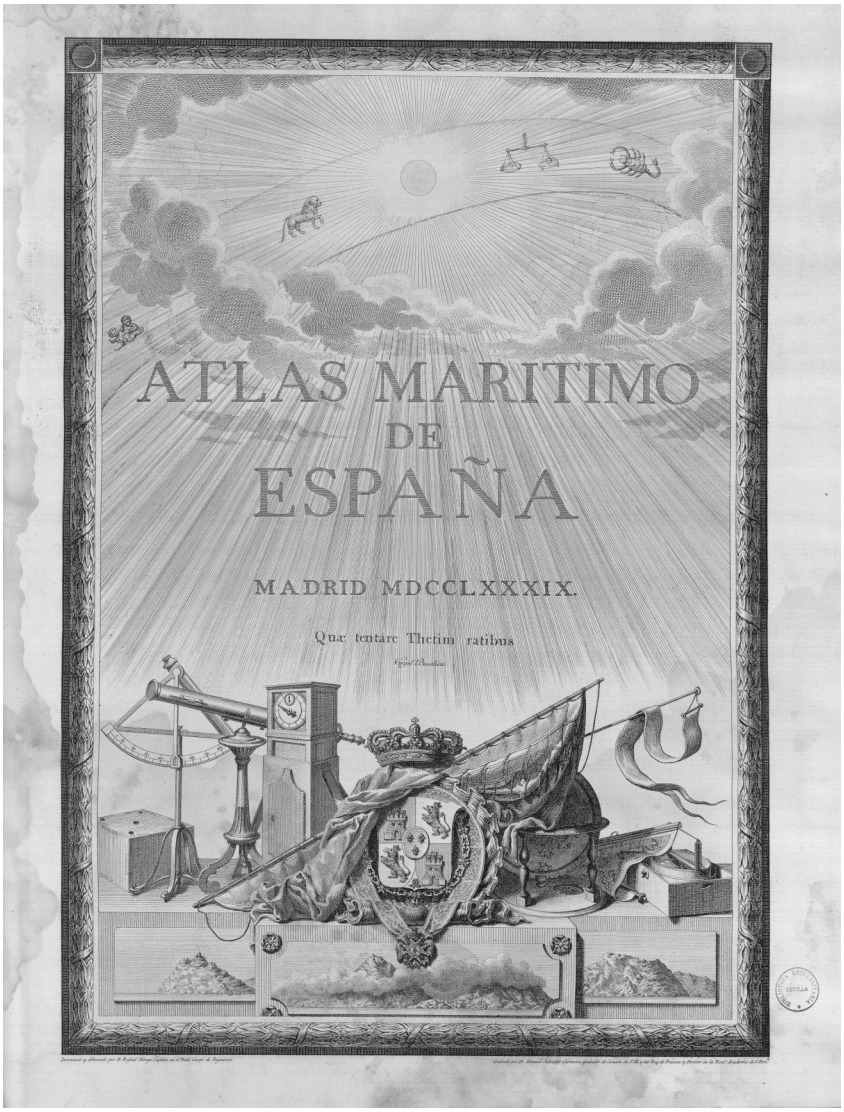

Figure 4.2 Raphael Mengs frontispiece to *Atlas Marítimo de España*. Madrid, 1789.

the survey, but it was to be conducted in accordance with the latest and most accurate methods available. Vincente Tofiño selected officers from among his students in the new

[111] Valdés to Tofiño, 23 June 1783, AMN ms. 1422; Salazar. *Discurso sobre los progresos y estado actual de la hidrografía en España*, 49.

curriculum to complete observational trips with him for the *Atlas marítimo*, including Julián Ortiz Canelas, José de Vargas Ponce, Alejandro Belmonte, and José Esponosa y Tello in 1783. The following summer, Dionisio Alcalá Galiano, José de Sanz, and Juan Vernacci joined the group of naval scientists who accompanied Tofiño. Along with these students, instruments from the Cádiz academy and observatory were utilized during the surveying trips. The instruments utilized were part of a larger collection purchased by Jaquinto Magallanes.[112] Each summer Tofiño extended his missions further aong the Iberian coast.[113] The first three summers were spent surveying the Mediterranean coasts. In 1786, Tofiño and his students surveyed from the Pillars of Hercules up the Atlantic coast, covering Portugal and Galicia. In 1787, the expedition completed the northern coasts, measuring the Basque region. Finally, in 1788, an expedition was sent to the Azores, to complete the coastal survey of Spain's European territories.

The charts produced by the Tofiño surveys were forwarded to José de Vargas Ponce, another of Tofiño's students in Cádiz, for publication. Two volumes were quickly

[112] For a description of this collection, see José Vargas Ponce, *Relacion del último viage al Estrecho de Magallanes de la fragata de S.M. Santa María de la Cabeza en los años de 1785 y 1786. Extracto de todos los anteriores desde su descubrimiento impresos y mss. y noticia de los habitantes, suelo, clima y producciones del estrecho. Trabajada de orden del Rey* (Madrid: Por la viuda de Ibarra, hijos y compañia, 1788), 4-6. Jacinto Magellan was a corresponding member of both the Royal Society of London and Paris Acádemie des Sciences. Magellan's description of the collection, and recollections about advancements in instrumentation and precision, may be found in João Jacinto de Magalhães, *Description des octants et sextants anglois,: ou quarts de cercle a reflection, avec la maniere de se servir de ces instrumens, pour prendre toutes sortes de Distances angulaires, tant sur Mer que sur Terre. Précédée d'un Memoire sur une nouvelle Construction de ces Instrumens; Et suivie d'un Appendix, contenant la Description & les avantages d'un Double-Sextant nouveau. Par M. J. H. de Magellan, Membre de la Société Royale de Londres, & Correspondant de L'Académie Royale des Sciences de Paris* (Paris: chez Valade, Libraire, rue Saint-Jacques, vis-à-vis celle des Mathurins. & à Londres, chez Elmsley, Libraire, dans le Strand, vis-à-vis Southampton Street, 1775). An inventory of the instruments sent in 1788 is found in: Francisco González González, *Instrumentos Científicos del Observatorio de San Fernando: (siglos XVIII, XIX, XX)* (Madrid: Instituto de Historia y Cultura Naval, 1995), 16.

[113] "Papeletas biograficas del jefe de escuadra D. Vicente Tofiño de San Miguel por José de Vargas Ponce," M-RAH; María Luisa Martín-Merás, "L' 'Atlas Marítimo de España,' 1787-1789," in *Cicle de confèrencies presentat amb motiu del Symposium IMCOS* (Barcelona: Institut Cartografic de Catalunya, 1986), 21-22.

produced in 1787, containing forty-five detailed depictions of the Spanish coastline.[114] The success of the first edition led to a second edition in 1789, collecting both initial volumes in a single work under the frontispiece of Rafael Mengs, a captain in the engineering corps. The lavish quality of this title page speaks to the national pride in the work (See Figure 4.2).

The Magellan Survey

Coinciding with the coastal survey directed by Vicente Tofiño, the Spanish Navy also sent successive voyages to the Straits of Magellan for the purpose of improving geographic knowledge of the region, or so was their declared purpose. The Navy, directed by royal edict, sent two expeditions – first aboard *S.M. Santa María de la Cabeza* in 1785, and later aboard the *Santa Eulalia* and *Santa Casilda* in 1788 – to conduct a hydrographic survey of the region and assess its value as a connection between the Atlantic and Pacific Oceans. Both voyages were under the direction of Antonio de Córdoba, who was accompanied on each voyage by young officers from the Academy of Naval Cadets.

Control of the Straits of Magellan was contested throughout the eighteenth century.[115] Encroachment by European powers in the Ibero-Pacific world was not new to

[114] *Derrotero de las costas de España en el Mediterraneo, y su correspondiente de Africa para inteligencia y uso de las cartas esféricas presentadas al rey nuesto señor pro el. exc.mo Sr. Baylío Fr. Don. Antonio Valdés, Gese de Esquadra y Secretario de Estado, y del Despacho Universal de Marina. Y construidas de orden de S.M. por el Brigadier de la Real Armada Don Vincente Tofiño de San Miguel, Director de las Academias de Guardias Marinas, de la Real Academia de la Historia, correspondiente de la de las Ciencias de París* (Madrid: por la Viuda de Ibarra, Hijos y Compañia, 1787); *Derrotero de las costas de Espana en el oceano Atlantico, y de las islas Azores o Terceras, para inteligencia y uso de las cartas esfericas presentadas al rey nuestro senor por el exc. Sr. baylio Fr. Don Antonio Valdes* (Madrid: por la Viuda de Ibarra, hijos y compania, 1787).

[115] As Laura Benton has shown, bodies of water and 'waterways' proved particularly vital for the retention of sovereignty: Benton, *A Search for Sovereignty*, 104–161.

the eighteenth century, but the increasing frequency of transits alarmed Caroline ministers. The Straits served as a vital bimarian passageway for global commerce at this time, linking the southern Atlantic to the Pacific. Expeditions of exploration, notably those of James Cook and Louis-Antoine de Bougainville, traversed the waterway, often leaving territorial markers as evidence of their passage. In addition, claims of sovereignty were built into printed travel accounts and surveying records. As the eighteenth century waned, Bourbon ministers in Madrid worried that the increasing numbers of English and French vessels traveling through the southern Atlantic indicated plans to colonize the region.[116] In dispatching the Magellan Survey, Madrid sought accurate knowledge of the region but also to assert sovereignty in a manner that would be convincing to its European rivals. In the Age of Enlightenment, Charles III and his ministers recognized that the assertion of sovereignty was best articulated in the language of science. Physical markers of sovereignty (such as plaques, carvings, and crosses) retained their value, but a mark on the map, an image rooted in mathematical measurement and certainty, carried heavy political weight as well.[117] Caroline Spain was no longer attempting a purely physical conquest. Instead, the Magellan Survey was a practical and intellectual enterprise dependent on its publications as much as its physical markers. The diplomatic policy pursued by Caroline ministers now relied primarily on

[116] Foreign settlement in the region, particularly by England, was an ongoing issue throughout the eighteenth century. Spanish officers tracked the number of foreign vessels navigating the southern Atlantic from the Río de la Plata down to the Tierra del Fuego, see: Ramon de Clairae, "Noticias adquiridas por el Capitan de Fragata, y comandante de la Corbeta Santa Elena, Don Ramon de Clairae durante el tiempo que tuvo el mando de la Isla Malvinas, desde 6 de Marzo de 1787 hasta 10 de Abril de 88 de varios Capitanes de embarca.nes Inglesas que estuvieron ancladas en el establecimiento de la soledad en estas Islas", AMN ms. 0327, doc. 8; Juan Antonio Gastelu, "Actuación de comandante de Fragata D. Juan Antonio Gastelu: Noticia de lo executado en los cinco Islas de San Andres, Santa Catalina, Providencia, Mangles grande y Mangles chica, por el Comandante de la Fragata Santa Agueda Don Juan Antonio Gastelu", Archivo Histórico Nacional (AHN) DC,31,N.95; "Razon de los Navios Fragatas y Paquebotes que navegan en este Mar de Sur hoy 20 de Junio de 1791 y los g.s.g.o que carga cada (vizo ___ a saber)", AHN DC,32,N.43.

[117] For more on physical sovereignty markers, see Lauren Benton, *A Search for Sovereignty: Law and Geography in European Empires, 1400--1900* (Cambridge: Cambridge University Press, 2010), 54-59.

the use of cartographic declarations of sovereignty to defend the colonial realm, while traditional acts of possession were now understood to be ceremonial and not legally binding. The Straits of Magellan, further, was a peripheral region in Spanish America with a sparse and highly nomadic native population; conquering such an area required a new style of conquest. In addition to subverting previous geographies, the Magellan Survey set out to conduct a type of surveying mission never before attempted by the Spanish empire.[118]

In 1785, Antonio de Córdoba, the naval officer charged with leading the Magellan Survey, filled the library of the *Santa María de la Cabeza* with past accounts of voyages through the Straits, including those of foreign explorers. Although the Magellan Survey's nominal mission was to settle a dispute regarding the utility of transit to the Pacific by means of the Straits instead of rounding Cape Horn, correcting mistakes in the geographical record was also an important goal of the Magellan Survey officers.[119] Córdoba noted in his diary that each navigator had to decide for themselves to "travel to the Pacific Ocean, by this route, or by Cape Horn: two points of great interest to Geography and Navigation, and, according to our ministers, to commerce."[120] In 1788,

[118] Spain had not assembled a comprehensive charting of the Straits since Francisco Seixas de Lovera oversaw the *Descripción geográfica y derrotero de la region austral magallánica* in 1690, Isidoro Vázquez de Acuña, "Las Exploraciones del Estrecho de Magallanes por el Capitán de Navío Don Antonio de Córdoba y Lasso de la Vega su primer viaje (1785-1786); su segundo viaje (1788-1789)," *Revista de historia naval* 22, no. 84 (2004): 7–8. The Magellan Survey, in turn, recorded new subjects of observation in response to these developments (such as temperature, magnetic variance, etc.), see: Vargas Ponce, *Relación*, 71–74; José Vargas Ponce, *Apéndice a la Relacion del viage al Magallanes de la fragata de guerra Santa María de la Cabeza, que contiene el de los paquebotes Santa Casilda y Santa Eulalia para completar el reconocimiento del estrecho en los años de 1788 y 1789. Trabajado de orden superior* (Madrid: Impr. de la viuda de D. J. Ibarra, 1793), 98.

[119] José Vargas Ponce, *Relacion del último viage al Estrecho de Magallanes de la fragata de S.M. Santa María de la Cabeza en los años de 1785 y 1786. Extracto de todos los anteriores desde su descubrimiento impresos y mss. y noticia de los habitantes, suelo, clima y producciones del estrecho. Trabajada de orden del Rey* (Madrid: Por la viuda de Ibarra, hijos y compañia, 1788), i–v; especially iiii–v.

[120] Antonio de Córdoba, "Diario de Navegacion que va a hacer el Capitan de Navio Don Antonio de Córdova sobre la Fragata de S.M. Santa María de la Cabeza con destino a reconocer el estrecho de

Ciriaco de Cevallos, a leading observer of the second voyage of the Magellan Survey, wrote in his diary that of all the navigators who had reached the Pacific by means of the Straits, few had purposely set out to survey its contours. "No one," he added, "has as of yet made an accurate and exact chart of the path."[121] This rhetoric was central to the image of an unconquered 'waterway' since no exact chart existed.

The observational practices employed by the Magellan Survey were an intricately choreographed dance. The Magellan Survey collected data from three specific locations: aboard the ship, in small launches, and on shore. The intentional redundancy of observations (the employment of multiple instruments and methods) and the routine checking of data (not only against present coordinates but against previously measured coordinates), all added layers of observational techniques that resulted in a sophisticated, unified practice employed by the naval observers.[122] The breadth and depth of the Magellan Survey observational record not only heightened the accuracy of Spanish cartographic projections of the region, but also was far superior to the geographic data collected by earlier foreign voyages.

Before its departure, the *Santa María* was equipped with an extensive selection of the latest surveying and navigational instruments. Foremost among them was a group of

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Magallanes, sondan sus Puertos, Bahias, Calas, y ensenadas Bajos, Planceres, y bancos; Observar los vientos reynantes, y periodo de sus Marneas, examinar los Canales principales, y Levantar los Planos de todo haciendo los observaciones Astronomicos que permita la Intemperie de su situación. Años de 1785 y 1786," AMN Ms. 0615, 2.

[121] Ciriaco de Cevallos, "Diario travajado a Borda del Paquebote Santa Eulalia por Theniente de Fragata Don Ciriaco de Cevallos en la navegacion que por los años de 1788 y 1789 hizo aquel bugue y en conserva del Santa Casilda al reconocimiento del Estrecho de Magallanes," AMN Ms. 0164/001, 2.

[122] For a detailed dicussion of the surveying methodology employed by naval officers as part of the Magellan Survey, see Matthew E. Franco, "Bridging the Divide: Science and Reform in the Spanish Navy (1783-1805)" (Master's Essay, Baltimore, MD: The Johns Hopkins University, 2011), 45-48, 57-59. The surveying methodology used by all three naval efforts described in this chapter was similar.

instruments purchased by Jacinto Magellan, a Portuguese astronomer living in London.[123] Instruments were also drawn from a collection gathered on Royal orders by Jorge Juan in London from among England's most celebrated craftsmen; these instruments included the latest technological advancements in surveying, astronomical observation, and marine science. Along with the London collections, the Magellan Survey carried instruments from the collection of the Royal Observatory and Academy of Naval Cadets at the naval depot in Cádiz.

The Royal Navy dispatched *S.M. Santa María de la Cabeza*, a frigate sailing under the command of Antonio de Córdoba, from Cádiz in October 1785 to complete the Magellan Survey. After failing to pass the Straits, the *Santa María* returned to Cádiz in June 1786. In October 1788, Córdoba sailed to the Straits again, this time with two smaller boats, the *Santa Casilda* and *Santa Eulalia*, to complete the mission.[124] These two voyages effectively extended the naval version of geographic reform to the colonial realm, producing two reports and many charts of the southern Atlantic and surrounding coastline.

The Malaspina Expedition

Following the return of the Magellan Survey, the Malaspina Expedition continued the exploration begun by Córdoba and crew.[125] Two ships, the *Atrevida* and *Descubierta,*

[123] For a description of this collection, see footnote 112.

[124] Reports were issued by the Royal Navy following the 1785 and 1788 voyages, see: José Vargas Ponce, *Relacion del último viage al Estrecho de Magallanes de la fragata de S.M. Santa María de la Cabeza en los años de 1785 y 1786. Extracto de todos los anteriores desde su descubrimiento impresos y mss. y noticia de los habitantes, suelo, clima y producciones del estrecho. Trabajada de orden del Rey* (Madrid: por la Viuda de Ibarra, hijos y compañia, 1788); Vargas Ponce, *Apéndice*.

[125] For an introduction to the Malaspina expedition see: Juan Pimentel Igea, *La física de la monarquía: ciencia y política en el pensamiento colonial de Alejandro Malaspina (1754-1810)* (Aranjuez: Doce Calles, 1998); Alessandro Malaspina, *The Malaspina Expedition, 1789-1794: Journal of the Voyage*

were dispatched the very year the second Magellan voyage returned. Malaspina, commanding the *Descubierta*, and José de Bustamente, leading the *Atrevida*, had received royal approval for a comprehensive mission to conduct a "scientific and political" survey in the mold of Cook's famed voyages to the Pacific.[126] Malaspina's secret, political instructions, however, called for him to observe colonial society and assess the potential for violent revolution, as well as foreign presence in the Pacific.[127] During its first phase from 1789 to 1792, the voyage spent time focused on the Spanish Atlantic and American coastlines. It first departed Cádiz for the Canaries before sailing down the Atlantic coastline, pausing to chart major ports, and rounding Cape Horn. From the southern Atlantic, Malaspina and his crew continued northward along the American coast to Alaska. After unsuccessfully searching for the Northwest Passage, Malaspina's expedition returned to Mexico. Here, Malaspina sent two smaller vessels, the *Sutil* and *Mexicana*, commanded by Dionio Alcalá Galiano and Caytano Valdés, respectively, back north to the Spanish settlement of Nootka to conduct more exhaustive studies of the region. For its second segment from 1792 to 1794, the voyage continued into the Pacific Ocean stopping at the Philippines, Port Jackson (Australia), Doubtful Sound (New Zealand), and Tonga. Leaving the Pacific, the Malaspina Expedition rounded Cape Horn again and paused in the Río de la Plata before returning to Cádiz.

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by Alejandro Malaspina, 3 vols., Works issued by the Hakluyt Society 3rd ser., no. 8 (London: Hakluyt Society in association with the Museo Naval, Madrid, 2001).

[126] Alejandro Malaspina, "Plan de un viaje científico y político a el rededor del mundo remitido a el Exmo. Sr. Bailío Fray Antonio, Valdes de Madrid en 10 de Sept. de 1788," AMN ms. 316. Charles III approved the proposal for a survery in 1788, before his death and the eventual success of the Magellan Survey. As a homage to Cook, the Malaspina Expedition would take two vessels (*Descubierta* and *Atrevida*), similar to Cook's own vessels (*Discovery* and *Resolution*): Malaspina, *The Malaspina Expedition, 1789-1794*.

[127] For a thoughtful reflection on the many missions and motivations of the Malaspina Expedition, see Juan Pimentel Igea, "Imperio e Ideologia Colonial en Alejandro Malaspina," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 277-283.

The Malaspina Expedition and Magellan Survey were intimately connected. Malaspina had been a part of the inner circle in Cádiz, studying at the Academy and rehearsing his observational routine in the Royal Observatory along with Alcalá-Galiano, Belmonte, Churruca, Cevallos, and Tofiño. The first group of junior officers to enter the course in higher mathematics, all of them lieutenants, began their studies May 29, 1783. Malaspina, however, is noted in the academy's register as entering service in Cádiz on December 3, 1784 at the rank of frigate-captain.[128] When the first and second voyages of the Magellan Survey were dispatched, Malaspina collected instruments for the surveying mission from the observatory and from officer's personal collections, calibrated those instruments against those kept in the observatory, and collected books for the ship's library.[129] In fact, many of the same instruments and personnel that had been sent with the Magellan Survey were also sent with Malaspina on his five-year expedition.[130] While Malaspina's ambitious expedition has long been championed as the archetypical 'Enlightenment' voyage in Spain, it is perhaps best seen as the more mature iteration of the long process of scientific reform in the Spanish navy.

Malaspina and his crew conducted astronomical studies similar to the Magellan Survey's localized study of the Straits. However, unlike in the Magellan Survey, the Malaspina Expedition was also called on to perform ethnographic, meteorological, and natural historical observation. While Spain had used botanical expeditions to search for new means of extracting wealth from the colonies before the naval curricular reforms

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[128] "Libro de oficiales agregados a la Compañia de Guardiasmarinas de Cádiz para hazer estudios mayores y para practicar la Astronomia en su Observatorio," AMN ms. 1146, f. 6v. Malaspina entered the Academy at the rank of *Capitán de Fragata* and was promoted on 10 September, 1785 to the rank of *Theniente de la Compañia*.

[129] Vargas Ponce, *Relación*, 5–6; de Cevallos, "Diario ... [de] Ciriaco de Cevallos ... por los años de 1788 y 1789," folio 2.

[130] Francisco González González, *Instrumentos Científicos del Observatorio de San Fernando: (siglos XVIII, XIX, XX)* (Madrid: Instituto de Historia y Cultura Naval, 1995), 16.

took place, the choice to commission an expedition of such a comprehensive scope was a sign of Spain's confidence in its recent scientific advances. Further, the intentional emulation of Cook's voyaging in the design of the Malaspina Expedition cannot be denied. Malaspina and José Bustamante y Guerra noted such emulation in their proposal for the expedition, submitted for consideration in 1788 and quickly approved by Charles III and Antonio Valdes:

> For the past twenty years the two nations of England and France, with a noble rivalry, have undertaken voyages in which navigation, geography, and the knowledge of humanity have made very rapid progress. This history of human society has laid the foundation for more general investigations; natural history has been enriched with an almost infinite number of discoveries; and finally, the preservation of Man in different climates, on extensive journeys, and among some almost incredible tasks and risks, has been the most interesting acquisition of these navigators.
>
> The voyage which is being proposed is particularly directed toward the completion of these objects; and the aspect which is being called the Scientific Part will certainly be carried out with much care, continuing with effectiveness the paths of Cook and La Pérouse.
>
> But a voyage undertaken by Spanish navigators must necessarily involve two other objectives. One is the making of hydrographic charts covering the most remote regions of America and the compilation of sailing directions capable of providing safe guidance to inexperienced merchant mariners. The other is the investigation of the political status of America both in relation to Spain and to other European nations.[131]

Malaspina's voyage did not limit itself simply to navigation or geography in the purely physical sense of geodesy or hydrography, although these were heavily emphasized, and instead focused on the totality of the modern science of geography. In part, this expanded definition of the new eighteenth-century science of geography began to include human geography along with new branches of physical geography.[132]

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[131] Malaspina, "Plan de un viaje científico y político a el rededor del mundo remitido a el Exmo. Sr. Bailío Fray Antonio, Valdes de Madrid en 10 de Sept. de 1788." As cited by Malaspina, *The Malaspina Expedition, 1789-1794*, Volume 1, 312–315; Engstrand, *Spanish Scientists in the New World*, 45.

[132] For observation of native populations by the Malaspina Expedition and its relation to evolving European attitudes towards the scientific study of native populations, see David J. Weber, *Bárbaros:*

As a result of its more ambitious mission, the Malaspina Expedition employed the services of Spanish as well as foreign naturalists and artists. To fill these roles, Malaspina employed Antonio Pineda y Ramírez, a creole officer of the Spanish navy; Luis Neé, a French born naturalized Spaniard; and Tadeo Haënke, a Bohemian offered to the voyage by the government of Sardinia.[133] The Magellan Survey, by contrast, had employed only Spanish naval officers for its voyages and it had not included trained naturalists, despite its occasional natural historical investigations.

Following his return to Spain, Malaspina was initially praised for his scientific and political work. But he soon began recommending drastic reforms in colonial policy and became embroiled in controversy leading to charges of advocating the overthrow of the Spanish government.[134] As a result of his fall, the effort to publish the voyage's results was immediately abandoned. The report of the Malaspina Expedition would have been the culmination of the establishment of a scientific Spanish navy. It collected so much information that seven volumes were planned for publication.[135] Following the politically charged downfall of Alejandro Malaspina, however, the results of his five-year voyage were not published until the late nineteenth century, and then only an abridged version was released.[136] While Malaspina's comprehensive report was delayed, however,

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Spaniards and their Savages in the Age of Enlightenment (New Haven: Yale University Press, 2005), 31-41.

[133] Pimentel Igea, *La física de la monarquía*, 25. For more on Pineda, see Andrés Galera Gómez, "Antonio Pineda y el Proyecto Cientifico de la Expedicion Malaspina," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, ed. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 257-263.

[134] For a brief description of his fall, see Engstrand, *Spanish Scientists in the New World*, 106–108.

[135] Iris Wilson Engstrand, *Spanish Scientists in the New World: The Eighteenth-Century Expeditions* (Seattle: University of Washington Press, 1981), 106–108.

[136] The abridged edition was published as Pedro Nova y Colson, ed., *Viaje político-científico alrededor del mundo por las corbetas Descubierta y Atrevida al mando de los capitanes de navío D. Alejandro Malaspina y Don José de Bustamante y Guerra, desde 1789 a 1794* (Madrid: Impr. de la viuda é hijos de Abienzo, 1885).

Alcalá-Galiano, Vernacci, and Conch were able to publish a catalog of stars as observed from the southern hemisphere. These observations, taken in Montevideo, were forwarded to the observatories in Cádiz, Paris, and Milan for examination.[137]

The Atlas Americano

The cartographic successes of the Magellan Survey and Malaspina Expedition inspired greater confidence in geographic reform among government ministers. Before either effort had been completed, José de Mazarredo began petitioning Antonio Valdés for approval to organize two hydrographic surveys of Spanish possessions.[138] Mazarredo cited growing concern over Spanish defenses in the Caribbean as motivating his proposed surveying mission, highlighting Trinidad, Cuba, Puerto Rico, and the Gulf region as especially vulnerable. His proposal named a collection of naval officers from Cádiz – practically all those not already committed to the Magellan or Malaspina voyages – as ideal officers to lead the hydrographic survey, including Pedro Winthuysen, Ignacio de Alava, Tomás de Ugarte, and Desdado Pinedo. Additionally, Mazarredo reminded Valdés that items from the collection of instruments purchased by Juan Jacinto Magallanes would be sufficient to complete the hydrographic survey.

Unbeknownst to José de Mazarredo, Antonio Valdés and the Spanish admiralty received two other proposals for nearly identical surveying missions from within the community of scientific officers at Cádiz. The first, forwarded by Alejandro Belmonte, José María de Lanz, José Espinosa y Tello, and Dionisio Alcalá Galiano, argued that

[137] Malaspina, *The Malaspina Expedition, 1789-1794*, 327.

[138] "Propuesta reservada sobre la organización de dos expediciones hidrográficas y los que deben estar al mando de éllas y de los buques," José de Mazarredo to Antonio Valdés. 5 August 1786. AMN ms 2381, fol. 114-117.

there was greater urgency to conduct fresh surveys of Spanish possessions in the north Atlantic and Caribbean than the peninsular coastlines.[139] These four suggested dividing the surveying expedition into two phases: the first covering the northern Caribbean and Gulf coastline, and the second charting the southern Caribbean and Tierra Firme. The second proposal, submitted by Tomás de Ugarte and Juan de Villavicencio, argued that Spain ought to complete detailed surveys of its Caribbean colonies in the wake of the loss of Cuba in 1762 and the recent independence of the British American colonies.[140] In addition to these dire warnings, Ugarte and Villavicencio argued that their voyage would allow new botanical research and would extend a "universal benefit" [*beneficio universal*] to all of the King's vassals and to the Spanish economy.[141] In Madrid, however, the governing body of the state was already moving forward with the proposal led by Alcalá Galiano and Belmonte.[142]

The two proposals for a survey of the American colonies continued along parallel tracts into December of 1788, meanwhile the second voyage of the Magellan Survey departed Cádiz and the initial proposal for the Malaspina Expedition was sent to the admiralty. Antonio Valdés wrote back to Ugarte and Villavicencio in early December, offering conditional royal approval of their plan, but asking for a more detailed

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[139] "Plan que parece el más conveniente para formar la carta de las posesiones españolas de América Septentrional," 18 January 1787. AMN ms. 146, doc. 9; "Proponer levantar las costas náuticas de nuestra América Sept," Belmonte, Lanz, Espinosa, and Galiano to Antonio Valdes, 18 January 1787. Archivo General de la Marina, Álvaro de Bazán (AGM-AB), Leg. 4948.

[140] "Proponer la formación de una Atlas Marítimo Americano septentrional," Villavicencio and Urgarte to Valdes, Isla de León, 28 November 1788. AGM-AB, Leg. 4948. These officers specified their area of interest as: "*un Atlas Marítimo de las Cartas y Planos de la parte de America septentrional y su derrotero, comprendida entre los 8° y 31° de latitud Norte, y 53° y 94° de longitud occidental de Cádiz; esto es la costa del continente desde la embocadura del Rio Orinoco hasta el de Santa Maria en la Florida oriental, e islas intermedias, y el conocimiento del celo conquista […]"*

[141] Ibid. 8, 11v.

[142] "Acuerdo de la Suprema Junta de Estado para la formación del Atlas Marítimo Americano," 13 November 1788. AGM-AB, Leg. 4948.

description of the proposed mission.[143] The day after Christmas, Ugarte and Villavicencio forwarded a formal plan for their survey to Antonio Valdés, outlining a methodology for the expedition and suggesting junior officers to be selected for service.[144] The effort would be completed in two phases. First, the mission would conduct defensively minded surveys of the major ports, bays, and inlets of the Spanish Caribbean. Second, ships would retrace the first passage and verify coordinates and refine plans to prepare their results for publication as a lavish atlas. Ugarte and Villavicencio identified four potential ships for their mission and outlined the size of crew they required for each of the two ships selected, including six scientific officers and three cadets from the academy in Cádiz. Early in the New Year, Vicente Tofiño wrote to Antonio Valdés to express his support for their plan, highlighting the same precarious conditions of Spanish colonies and trade that his pupils had mentioned in their proposals.[145]

In March, José de Mazarredo expanded his proposal to the naval minister as well, outlining the strengths and weaknesses of his initial plans.[146] After commenting on the best schedule for conducting the Caribbean survey, Mazarredo detailed the instruments he deemed necessary as well as listing foreign geographic texts that each boat ought to consult during their surveying expedition.[147] In April, the mission finally received royal approval and José de Mazarredo was given authority to select the vessels and officers needed to complete the expedition.[148] It seems that by June, Mazarredo was alerted to the

[143] Valdés to Ugarte and Villavicencio, Madrid, 9 December 1788. AGM-AB, Leg. 4948.

[144] "Plan de la formación de un Atlas marítimo Americano septentrional," Ugarte and Villavicencio to Antonio Valdés, Isla de León, 26 December 1788. AGM-AB, Leg. 4948.

[145] "Informa sobre el Plan propuesto para la formación del Atlas […]," Vicente Tofiño to Antonio Valdés, 10 January 1789. AGM-AB, Leg. 4948.

[146] "Dictamen sobre el Plan para la formación de un Atlas Marítimo de la América septentrional," José de Mazarredo to Antonio Valdés. Madrid, 7 March 1789. AGM-AB, Leg. 4948.

[147] Ibid. 10v-12v.

[148] Real cédula, 6 April 1789. AGM-AB, Leg. 4948.

rival plan forwarded by his subordinates. He wrote a covert epistle to Valdés deriding Ugarte and Villavicencio, who were soon removed from further consideration.[149]

The mission was finally dispatched in 1792 under the direction of Cosme de Churruca and Joaquín Francisco Fidalgo. Antonio Valdés gave the two officers detailed instructions, highlighting the poltical and scientific obligations that their survey would fulfill for the Spanish monarchy.[150] However, Cosme de Churruca returned to Spain in 1795, too sick to complete the geographic mission. Completed between 1792 and 1810, the survey was conducted in two phases, as proposed, with the first covering the northern Caribbean and Gulf coastline and the second charting the southern Caribbean and Tierra Firme.[151] Various naval officers, including Ciriaco de Cevallos and José de Espinosa y Tello, also contributed to the Caribbean reconnaissance mission.

The "Atlas Americano" was never completed or published as proposed. However, its survey data was combined with previous voyages – including the Magellan Survey and Malaspina Expedition – as the basis for a comprehensive, centralized archive of Spanish colonial geography from the Bourbon era. Beginning in 1805, this archive, the Hydrographic Depot of the Spanish Navy, issued a number of atlases under the title *Atlas marítimo de las costas de las posesiones españolas en América*.[152] These atlases relied on

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[149] José de Mazarredo to Antonio Valdés, Madrid, 15 June 1789. AGM-AB, Leg. 4948. Mazarredo proposed a number of different officers from the Academy of Naval Cadets in Cádiz for the mission, including Fernando Noguero, José de Salazar Rodríguez, Máximo de la Riva, and Sebastián Páez. Each of these officers was unable to lead the mission, however, either because of participation in the ongoing Malaspina Expedition or other naval duties.

[150] "Instrucción para los comandantes de las Divisiones," Antonio Valdés, Aranjuez, 30 March 1789. AGM-AB, Leg. 4948.

[151] For accounts of this expedition, see María Luisa Martín-Merás, "La Expedición Hidrográfica del Atlas de la América septentrional, 1792-1805," *Journal of Latin American Geography* 7, no. 1 (2008): 203–218; Ma. Dolores González-Ripoll Navarro, *Trinidad: la otra llave de América: descripción de la isla de Trinidad por Cosme de Churruca y la expedición del Atlas de la América Septentrional, 1792/1810*, (Caracas: Lagoven, 1992).

[152] For two examples, see Dirección Hidrográfica de España, *Atlas marítimo de las costas de las posesiones españolas en América* (Madrid: Dirección Hidrográfica de España, 1805) [Centro Geográfico de

the partially completed work of Churruca and Fidalgo as well as maps produced by other graduates of the curriculum in naval science at Cádiz.

If we pause to consider the intellectual and technological connections between voyages, tracing personnel and instrumentation that were common to multiple expeditions, it becomes clear that the four efforts discussed here were part of a common geographic mission. No voyage – not even that of Malaspina – was distinct from the larger project of geographic reform. A small group of individuals educated in Cádiz in new methods of scientific cartography were then dispatched on surveying expeditions to use that methodology collect empirical data that could be analyzed by Caroline ministers to improve Spanish colonial governance, to protect Spanish America from European encroachment, and to revitalize the Spanish economy. Although well over a hundred naval officers contributed to geographic expeditions from 1780 until 1810, I have identified twenty individuals who link the previously discussed four efforts (see Table 4.1). These officers took the skills they acquired in Cádiz and created a comprehensive and modern cartographic outline of the Spanish empire in the late eighteenth century.

Ejército (CGE) Ar.4-At.163]; Dirección Hidrográfica de España, *Atlas Maritimo de América y Oceania* (Madrid: Dirección Hidrográfica de España, 1816) [Archivo Histórico Nacional (AHN) Estado MPD.740.].

	Atlas Marítimo de España	Exploraciones del Estrecho de Magallanes	Expedicion Malaspina	Atlas Americano (Atlas de la América septentrional)
Vicente Tofiño de San Miguel	X	X	X	X
José de Vargas Ponce	X	X		
José Espinosa y Tello	X		X	X
José de Sanz (Lanz)	X			X
Juan Vernacci	X		X	X
Felipe Bauzá	X		X	
Dionisio de Alcalá Galiano	X		X	X
Alejandro Belmonte	X	X		X
Alejandro Malaspina	X		X	X
Joaquín Camacho	X	X		
Juan de la Cruz	X	X		
Antonio Castellanos	X	X		
Cosme Damián de Churruca y Elorza		X		X
Joaquín Francisco Fidalgo		X		X
Ciriaco de Cevallos		X	X	X
José de Mazarredo	X	X		X
Cayetano Valdés			X	X
Juan Antonio Gutiérrez de la Concha			X	X
Juan Jacinto Magallanes collection of instruments	X	X	X	X

Table 4.1 Comparison of Participation of Spanish Naval Personnel in Geographic Missions, 1783-1810

Conclusion

During the final decades of the eighteenth century, discussion of the merits of the two geographic styles described in this chapter took place in the "Sala de Geográfia" at the Royal Academy of History. The Royal Academy of History had remained focused on producing a particular style of geographical knowledge during the Caroline period, dutifully documenting the historical origins of "modern" Spain and Spanish culture.[153] Throughout the eighteenth century, academicians focused on the scientific study of the ancient and early modern history of Spain.[154] By the late-eighteenth century, however, the result of applying this methodology to geographic reform was beginning to receive criticism. While this new scientific view of history was empirical, the "Sala de Geográfia" recognized that geographic products informed by the dutiful study of archival records could not be used to validate Spanish sovereignty in diplomatic negotiations or guide domestic reform.

Discussions began in 1764 after the conde de Campomanes proposed a new dictionary project to the Academy of History, the *Diccionaro geográfico-histórico*. Soon after, during the 1780s and 1790s, the "Sala de Geográfia" at the Royal Academy of History reflected on their methodological approach to the science of geography. Successful publications by naval scientists, especially Vicente Tofiño's *Atlas marítimo de España*, began to sway favor towards adopting a new methodology.[155] Tensions amongst the academicians escalated in 1786 when Campomanes recommended José de Vargas

[153] For the origins of the geographical focus of the Royal Academy of History, see the royal order formally recognizing the institution: Real cédula, 17 junio 1738. RAH, M-RAH 9/3595(13).

[154] See, e.g., "Diccionario de voces españolas geográficas," RAH, ms. 11/7973; "Geografía de la América española," M-RAH 9/4164-64bis; "Apuntaciones para una geografía antigua y moderna," M-RAH 9/6354-56.

[155] See, e.g., "Cuenta dada a la Academia nº 17 de Julio de 1792," "Junta de 13 de Julio de 1792," in "Actas de la sala de Geografía," M-RAH 11/8222

Ponce and Vicente Tofiño be admitted to Royal Academy of History, much to the dismay of Tomás López.[156] Thereafter, the content of the *Diccionaro geográfico-histórico* progressed along a middle path between the observational empiricism of the naval scientists and the historical empiricism of cabinet geography, satisfying no one.

This chapter studied institutional approaches to geographic reform in Bourbon Spain, comparing approaches at the Royal Academy of History and the naval center in Cádiz. Ministers entrusted these institutions with mapping projects in the hope that their results would support the ongoing project of state reform. It was these institution's respective attempts to create geographic visions of Spain that highlight the struggle of the geographic reform project to respect Spanish cultural values while producing a geography that encapsulated the innovation of mathematical cartography. Caroline ministers asserted that geographic reform had to be based in empirical study, but the two institutions entrusted with geographic reform interpreted empiricism differently. It is the difference between their understandings of empiricism that produced two types of Spanish maps in the late-eighteenth century – maps illustrative of geography as observed in the field and maps demonstrating geography distilled from historical evidence.

The Royal Academy of History was the home for a historically informed geographic methodology. As members of the Academy worked to create a geographic dictionary of Spain, they also supported the careers of Tomás López and Juan de la Cruz Cano as each worked to prepare cartographic representations of the Spanish world. The use of "cabinet geography" by López as he completed his *Atlas de España* served to promote a historicized image of Spain and hide the evolving landscape of the new

[156] López Gómez and Manso Porto, *Cartografía del siglo XVIII*, 171-172; Martín-Merás, "L' 'Atlas Marítimo de España,' 1787-1789," 26.

centralized Spanish state. The marqués de Grimaldi commissioned Juan de la Cruz Cano to complete a map of the Ibero-American boundary. Government officials criticized his completed map for distorting boundaries and failing to conform to field observations. The criticism of this methodology was not limited to government officials, when conflict covered the Iberian Peninsula after 1808 military commanders complained that they were unable to use López's maps to devise effective military strategy. This led British and French military engineers to produce maps of the Spanish peninsula, such as the one in the hands of Don Pedro in the painting described at the beginning of this chapter.

Naval officers in Cádiz, meanwhile, utilized a very different geographic methodology, relying on field observations and astronomical coordinates. This chapter described how the scientific and technical education of naval officers at the Academy of Naval Cadets informed two atlas efforts: the *Atlas marítimo de España* and the *Atlas de América*. The use of an observationally informed cartographic methodology by naval officers led to the celebration of their geographic products by state ministers and foreign observers alike. The data of the Magellan Survey, for example, was well regarded and relied on, in part, by Captain Robert Fitz Roy during his first expedition to the region aboard HMS *Beagle*.[157] He wrote that it was the "most complete, and, probably, the only good account of the navigation of the Straits of Magalhaens [sic.]." "It is written" he added "in a plain and simple style, gives a most correct account of every thing seen, and should therefore be in the possession of every person who attempts the navigation of the strait."[158]

[157] Charles Darwin would accompany Robert FitzRoy on the second expedion to the region aboard the *Beagle*.

[158] Robert FitzRoy, *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle, between their years 1826 and 1836, describing their examination of the southern shores of South*

The cartographic images demanded by Caroline ministers were expected to aid in the defense of Spanish sovereignty diplomatically and represent the rapidly centralizing Spanish state. The objective of Caroline ministers was state science that could expose monarchial inefficiency and guide rational governance. These two institutions worked to fulfill the goal of geographic reform, with the navy focused on the colonial realm and the Royal Academy of History focused on the peninsula. While naval observers utilized geographic methodologies derived from astronomy and navigation, the Royal Academy of History produced geographic images informed by an emerging eighteenth-century understanding of history as a human science. Caroline ministers and foreign observers expected precise and exact maps to be produced by both institutions, but this could only have resulted from the methods of mathematical cartography. While individuals at the Royal Academy of History had originally believed they were pursuing geography based on a modern science – the science of history – their images were ill-suited to the questions of governance, political economy, and military defense that reform demanded.

America and the Beagle's circumnavigation of the globe, vol. 1 (London: Henry Colburn, Great Malborough Street, 1839), 9–10.

Part III
Chapter Five
Geographic Empire: Caroline Reform and the Practice of Geographic Science

While introducing the results of his peninsular census, José Moñino (1728-1808), conde de Floridablanca and one of the most trusted advisors of Charles III, positioned his contribution to Spanish geography by offering a brief synopsis of previously attempted state geographic projects. Describing efforts to map the Iberian peninsula beginning during the reign of Philip II and concluding with mapping projects during the reign of Ferdinand VI, Floridablanca summarized the contribution of these previous projects by noting that "none of these works is similar to that which I now present."[1] He was correct. Not only was the geographic structure of the census distinct from earlier projects, but unlike many previous efforts the census had also been completed and published. Beginning with the effort to construct a complete atlas of the peninsula under Philip II, geographic works sponsored by the Spanish government tended to remain secretive and incomplete until well into the mid-eighteenth century.[2] Recall that the Royal Academy of History had been organized in 1738 to produce a geographic dictionary, but publication of the *Diccionaro geográfico-histórico de España* did not begin until 1802.[3] In fact, despite the active pursuit of a reformed Spanish geography to correspond to the political

[1] *España dividida en provincias é intendencias, y subdividida en partidos, corregimientos, alcaldias mayores: obra formada por relaciones originales qe. de orden de S.M. se pidieron por su ministro de Estado, Conde de Floridablanca, en 22 de Marzo de 1785, con un nomenclator o Diccionario de todos los pueblos del Reino, que compone la segunda parte* (Madrid: Imprenta Real, 1789), 8–10, quote on 10. "*[…] pero no siendo ninguna de estas obras semejante a la que por ahora se presenta […]*"

[2] For an overview of these issues, see: Crespo Sanz, "Los atlas de españa entre 1503 y 1810."

[3] Real Academia de la História, *Diccionario geográfico-histórico de España, por la Real Academia de la Historia. Seccion I comprehende el Reyno de Navarra, Señorío de Vizcaya, y Provincias de Alava y Guipuzcoa. Seccion II comprende La Rioja ó toda La Provincia de Logroño y algunos pueblos de la de Burgos* (Madrid: Imprenta de la viuda de Joaquín Ibarra, 1802-1846). For more on this effort, see Chapter Four, pp. 169-172.

and economic reforms of the monarchy, many Spanish geographers still failed to complete their state sponsored projects.

The Floridablanca census exemplifies the vision of Spain that the science of geography brought to state reform. The effort had been completed quickly thanks to its use of a practical methodology, had been compiled out of a series of different surveys of the countryside, and sought to present the image of a grander, unified Spain by contextualizing Castile as one among the historical kingdoms. Importantly, publication of the completed census also promoted a uniform national identity amongst Spaniards by producing a single register in which all Spaniards were listed.

This chapter will examine the relationship between geographic practices and some of the defining characteristics of Caroline reform, such as its commitment to state centralization, the defense of imperial peripheries, and the growth of the imperial economy. The interactions between the science of geography and state reform were not exclusively cartographic in nature, but also included data-driven analysis and culturally significant non-cartographic acts of territorial possession. It would be inaccurate to suggest that the Bourbon Reform universally influenced developments in eighteenth-century Spanish geography. I will argue, however, that reform concerns congealed into a unique and definable geographic vision characterized by three essential components: a pragmatic methodology, observational redundancy, and a focus on peripheral regions. While these characteristics have been alluded to in previous chapters, this chapter will use select episodes to purposely illustrate this geographic vision. These episodes should not be considered an exhaustive accounting of the ways in which this geographic vision describes geographic practice in Bourbon Spain. Indeed, additional episodes may be

found elsewhere in this dissertation, as well as in projects of state reform that have not been specifically addressed here.

The chapter will open by considering the pragmatic manner in which Caroline ministers adopted geographic data to their projects of state reform. While pragmatism was also a defining characteristic of geographic practice in the field, this section will focus on the pragmatic use of geographic data by the government in Madrid. To do so, it first defines and then considers what I term a 'spirit of quantification' within Caroline Spain. This 'spirit' describes of how geographers aided the ministers guiding state reform by collecting and analyzing economic and demographic data from across the global Spanish monarchy. This section examines the failed attempt of the conde de Floridablanca to create a civil institution devoted to the practical arts and pragmatic analysis of geographic data, and which would supervise state projects aimed at quantifying the Spanish monarchy. I argue that the 'spirit of quantification' described here arose because geographically informed reform necessitated evidence to support the radical shifts in state policies reformists were advocating.

The chapter continues by highlighting how the geographic vision supported Caroline ministers' emphasis on monarchical engagement of peripheral regions. The complicated relationship between the metropolis and the imperial periphery described in this chapter was frequently related to encroachment by foreign merchants, leading to Spanish fears of losing economic control of these resource rich regions. In order to defend the imperial periphery, geographers were forced to simultaneously advance Spanish claims of territorial sovereignty using language of mathematical observation aimed towards foreign governments, while convincing Spaniards residing in these

neglected regions of their participation in the larger imperial machine by means of historical science and religious consecration. The argument concludes that as reformers attempted to insert the neglected imperial periphery into the history of the empire, they developed culturally significant non-cartographic and in their opinion incontestable means of declaring sovereignty. This is first described in a section examining how observational redundancy was used to settle border disputes in the Pyrenean region. This redundancy entailed the application of multiple surveys utilizing both mathematical and historical methodologies to create a layered geographic description of the disputed border. Next, the chapter examines three episodes of declaring sovereignty in the Ibero-Pacific. These episodes illustrate the complex nature of geographical practice employed both by Spanish agents at the imperial periphery and Spanish ministers in the metropolis, particularly their understanding of the power of religious consecration as a means of possessing territory.

Pragmatic Methodologies: the Spirit of Quantification

Ministers under Charles III promoted pragmatic reform of governance guided by rationality, geographic sensibility, and measurement of the monarchy. For these ministers, measuring the monarchy entailed quantifying various elements of the realm, including the exhaustive enumeration of the size of Spain in leagues, its demographics in *ciudadanos* and *vecinos*, and its potential economic output in terms of natural resources. As was argued in Chapter Four, academicians at the Royal Academy of History and officers from the naval center in Cádiz contributed to this effort by physically measuring the global Spanish monarchy during the Caroline period. Just as state ministers sought

geographic atlases based upon field observations as legal evidence of territorial sovereignty, the 'spirit of quantification' sought empirical evidence to support the reform program. Ministers called for concrete observations of the condition of the Spanish monarchy, to be supplied as numerical, cartographic, or otherwise empirical data.

The Royal Academy of History and naval depot in Cádiz were not the only settings for modern science that arose in Bourbon Spain, however. Ministers and public intellectuals, such as Gaspar Melchor Jovellanos, attempted to organize new centers to guide the reform project. Attempts to organize a national body for the promotion of state science outside of the military proved difficult, however. Nevertheless, successful regional organizations did exist. In addition to the regional societies of 'Friends of the Country' (*Sociedades de amigos del país*), Charles III elevated the Barcelona Royal Academy of Natural Science and Arts to the status of a recognized academy in 1770.[4] The Madrid Royal Botanical Garden, Natural History Cabinet, Cabinet of Machines, and San Fernando Fine Arts Academy, were other such institutional settings.[5]

It is worth examining one failed attempt to create a national scientific society in Madrid for what it demonstrates about the desire for centralized state bodies that could quantify aspects of the global Spanish monarchy. José Moñino, conde de Floridablanca, worked during the 1780s to establish a national academy of arts and sciences in Madrid, but the project never moved past its organizational phase.[6] Floridablanca collected the

[4] James E. McClellan III, *Science Reorganized: scientific societies in the eighteenth century* (New York: Columbia University Press, 1985), 139.

[5] Daniela Bleichmar, *Visible Empire. Colonial Botany and Visual Culture in the Eighteenth-Century Hispanic World* (Chicago: University of Chicago Press, 2012), 23-29. For more on the Natural History Cabinet, later the National Musueum of Natural Sciences, see: Agustín J. Barreiro, *El Museo Nacional de Ciencias Naturales, 1771-1935*, edited by Pedro M Sánchez Moreno (Aranjuez: Doce Calles, 1992), 53-116.

[6] A collection of documents detailing Floridablanca's efforts may be found in "Apuntamientos sobre el proyecto de establecimiento de una Academia de Ciencias y Buenas Letras en Madrid," Archivo

membership rosters and regulations of European scientific societies, including those in London and Paris, while organizing his plans, and also from newer institutions, such as those in Saint Petersburg, Berlin, Lisbon and Naples.[7] Archival material that survives from the effort explain Floridablanca's rationale for assembling the collection of papers: he sought to identify rising intellectual figures in Europe and recruit them as chairs for this new Spanish academy. This plan was reminiscent of the recruitment of foreign technicians by the marqués de la Ensenada described in Chapter Two. While Floridablanca certainly looked to established academies for the structure and bylaws his new institution would adopt, he chiefly sought to elevate the intellectual environment of Spain to the level of its European neighbors:

> The joining of the sciences and arts in a [single] body which embraces them both, such as exist in Berlin, Rouen, and other cities, appears the only method of fostering in Spain the faculties that are based [as much] on judgment, exactness, and solidity as on wit, erudition, and good taste, in such a way as to attend simultaneously to the utilitarian and agreeable [goals of this nation].[8]
>
> We should not pretend that from this place we are creating an academy [*un cuerpo de sabios*] that may [immediately] compete with the academies of London, Paris, Berlin, etc. Bringing together from all parts [of the kingdom] enough of the moderately well-educated men who remain, there should be established an institution that may always renew and grow, in order to stop the decay of science down which we walk, and of the arts [which decay] for lack of prizes…[9]

Acknowledging the challenge of creating an academy that would immediately compete with established European scientific societies, Floridablanca simply sought the establishment of an academy that could ease the challenges currently faced by the reform

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Histórico Nacional (AHN), Sección Estado, Legajo 3022, sec. 2. McClellan comments about what is presumably this same project, which he incorrectly states to have been a purely scientific institution: McClellan III, *Science Reorganized*, 139.

[7] "Apuntamientos sobre el proyecto de establecimiento de una Academia de Ciencias y Buenas Letras en Madrid," 2. This collection includes papers delineating the members and regulations of the Royal Society of London, Académie des Sciences, Royal Society of Berlin, and Academy of Arts and Sciences in Saint Petersburg.

[8] Ibid., sec. 1, f. 1.

[9] Ibid., sec. 1, f. 3.

movement. Foremost among these challenges was the lack of an institution equipped to collect and analyze geographic information detailing the current state of the Spanish monarchy. Currently in the midst of preparing his census, Floridablanca was keenly aware of the disorganization of geographical data within the Spanish government. Floridablanca did not hope to create an institution that would produce radical theoretical innovations, but one devoted to the pragmatic purpose of guiding state reform.

The National Academy of Arts and Sciences was to be established in Madrid and would be divided by discipline, and then subdivided by level of membership. Much like the Académie in Paris, members could be elected to the offices of pensioners, honorary, adjunct, or associate correspondent. There were to be six classes, or disciplines, whose order demonstrates that the most important aspect of the academy was promoting the practical pursuit of science. The first class was to be mathematics, the chair of which Floridablanca sought among naval officers. The second class was physics, broadly covering mechanics, experimental philosophy, chemistry, and pharmacy. Floridablanca listed among his possible candidates for chair no less than Lavoisier, Berthollet, and Sage.[10] The third class was to be natural history, for which Floridablanca listed the promising José Celestino Mutis or a foreigner named Richard as candidates.[11] The fourth

[10] These three figures, chemists all, were members of the Académie des sciences. Although Sage was clearly the least qualified of the group, he is remembered as the founder of the Paris Éole des Mines. Lavoisier, the father of the 'new' chemistry, inspired a substantial following in the late eighteenth century with his oxygen based theory of chemical action, before falling to the guillotine during the Reign of Terror. Berthollet, among Lavoisier's earliest public supporters, is best remembered for his involvement in the debate surrounding the existence of phlogiston. See Henry Guerlac, "Sage, Balthazar-Georges," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008); Henry Guerlac, "Lavoisier, Antoine-Laurent," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008); Satish C. Kapoor, "Berthollet, Claude Louis," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008).

[11] José Celestino Mutis traveled to New Granada as the viceroy's physician in 1760. In New Granada he pioneered the teaching of mathematics, taught Copernican astronomy, and, beginning in 1783, led a botanical expedition through the region. In 1802 he helped found the *Sociedad de Amigos del País* and an observatory in Bogotá the following year. For a brief description of his life, see J. Vernet, "Mutis y

class would be medicine, fifth would be antiquities, and sixth would be the arts. As has been observed in the case of reform at the Academy of Naval Cadets, Floridablanca's proposal generated a flurry of letters expressing interest.[12] Letters continued to be sent after Floridablanca's initial failure to organize the academy and even past his ousting from the government in 1792 by the Queen Consort of Charles IV, María Luisa.[13] Despite Floridablanca's longstanding commitment to the creation of an institutional setting similar to the Royal Society, Académie des sciences, or even the American Philosophical Society, his efforts did not lead to the creation of a stable national institution. The influence of Pedro Rodriguez, conde de Campomanes, did lead to establishment of regional societies of 'Friends of the Country' (*Sociedades de amigos del país*). While these societies collected information on regional affairs, they did not provide the sort of centralized governmental mechanism that Floridablanca had proposed. The Academy of Naval Cadets was the national institution that came closest to approximating Floridablanca's intention.[14] This was not a civil institution, however, as Floridablanca had proposed, and instead was organized to fulfill the mission of improving military science.

It has been challenging for historians to discern the relationship between military 'academies' and scientific 'academies' throughout eighteenth-century Europe.[15] Just as Spain's involvement in the Enlightenment has been the subject of some debate, the

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Bossio, José Celestino Bruno," *Complete Dictionary of Scientific Biography* (Detroit, Mich.: Charles Scribner's Sons, 2008). I am at a loss to identify Mss. Richard.

[12] Henrique Antonio Mathivet de la Pierre to José Moñino, "Petition for membership", December 6, 1789, AHN/SE/Legajo/3022(2), folio 1; Julian de Velasco to José Moñino, "Petition for membership", January 23, 1786, AHN/SE/Legajo/3022(2), folio 3.

[13] Ferdinand VII, "Collected petitions for membership", 1822, AHN/SE/Legajo/3022(2), folio 6, Archivo Histórico Nacional. The collection of these petitions by the formerly disposed monarch is suggestive of how interlinked notions of modern science and nationhood had become.

[14] See Chapter Four, pp. 188-221.

[15] McClellan III, *Science Reorganized*, 22.

existence of proper scientific societies in Spain at this time has also been questioned.[16] As should be clear from the preceding pages, if Spain lacked the formal institutional setting characteristic of scientific societies in the eighteenth century, it was not because it lacked interested individuals willing to promote such institutions. Some European scientific societies arose out of private meetings and later received royal recognition, such as the Royal Society of London, while others were founded explicitly by royal decree, such as the Académie des sciences. While other European institutions pursued the ennoblement of science and of the nation as a whole, all efforts to organize a similar institution in Spain failed. While Caroline ministers relied on the scientific enclave at the naval depot in Cádiz to fill the role of a national scientific body, this relationship jeopardized the stability of Spanish state science and hindered the continuity of research. Following the tremendous loss of naval scientists at Trafalgar during the Napoleonic Wars, the fragile nature of Spain's scientific progress was exposed.

Floridablanca had hoped that a civilian academy would provide an institutional home for his many projects of state reform. While no specific project was described as part of Floridablanca's proposal to form a national academy, he is clear that the academy was meant to be the home for the many projects initiated by Caroline ministers. Such projects were not aimed at investigating nature, but were pragmatic investigations of the nature of monarchial governance. Floridablanca imagined how the academy would promote the latest scientific and technological advancements in Europe and that its members would apply their knowledge to produce precise and comprehensive analysis of the Spanish monarchy. Each of Charles' trusted ministers – Floridablanca, Campomanes, and Jovellanos – pursued projects of quantification. Guided by analysis of numerical

[16] Ibid., 138–139.

data, Caroline reformers attempted to optimize governance and curb monarchial inefficiencies.[17] Their proto-statistical analysis led Caroline reformers to cast aside entrenched noble privileges and liberalize the imperial economy. Reform also highlighted imperfections in the monarchy's structure leading to the creation of new viceregal authorities in Spanish America and review of the *Quinto Real* in the Pyrenees, among other shifts.[18] A number of projects previously discussed in this dissertation were guided by an ethos of pragmatism and quantification, including the Enseneadean reform projects to establish a single tax for the peninsula and the effort to measure imperial timber production for naval reform.[19] The *catastro* of the marqués de la Ensenada (1753) and the census of the conde de Aranda (1768) had marked a departure from Habsburg efforts by employing a scientific methodology designed to privilege certain genres of information in order to create a complete image of the country and guide reform. Their advances were furthered by José Moñino, conde de Floridablanca, during his 1789 national census. Floridablanca relied on both civil and ecclesiastical authorities to gather information. The resulting census provided an image of the size of the Spanish population, but also analyzed the population in terms of class structure, occupation, and economic impact.[20] Importantly, one effect of the publication of the Floridablanca census was to promote uniformity of national identity amongst Spaniards.

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[17] For a summary of the economic theory of Jovellanos, see John Herman Richard Polt, "Jovellanos and His English Sources: Economic, Philosophical, and Political Writings," *Transactions of the American Philosophical Society* 54, no. 7 (1964): 15–42.

[18] For the restructuring of Spanish America, see Allan J. Kuethe and Kenneth J. Andrien, *The Spanish Atlantic World in the Eighteenth Century: War and the Bourbon Reforms, 1713–1796* (New York: Cambridge University Press, 2014), 271-304.

[19] For more on these efforts, see Chapter Two. For the Ensenadean forest survey, see pp. 99; for demography and the single tax proposed by Ensenada, see pp. 104-111.

[20] For more on the history of census' in Spain, see Joaquín Arango, "Origen e historia de los censos en España," *Revista del Centro de Estudios Urbanísticos, Municipales y Territoriales*, no. 23 (1980): 17–20.

In addition to adopting new methods for data collection, Caroline ministers also sought new practical methods of applying data towards effective governance. The doctrine of the Physiocrats and the writings of Adam Smith, in particular, influenced Caroline reformers' ideas about rational and efficient governance.[21] Richard Herr, in particular, has written about how Caroline reformers utilized numerical data to reform agrarian policy on the peninsula.[22] Jovellanos was most influenced by Adam Smith, opposing both mercantilism and the Physiocrats. Campomanes advocated reform of the domestic economy, but remained a staunch mercantilist and thus reluctant to liberalize foreign trade.

Floridablanca also applied data to pragmatic reforms of governance in novel ways. The data gathered by his census led to some surprising realizations for the Caroline monarchy, one example being the failures of civil infrastructure. In order to stimulate the internal market and lessen import dependency, Caroline reformers lessened highway taxes to promote the circulation of goods and labor sources.[23] Caroline reformers, especially Jovellanos, saw roads, canals, and ports as essential to stimulating the domestic economy. Jovellanos wrote that the national industry would grow "in proportion to the aid provided by the government for canals, roads, bridges, sewers, ports, levees

[21] Juan Hernández Andreu, "La única contribución del Marqués de la Ensenada y el impuesto único de la Escuela Fisiócrata," *Moneda y Crédito*, no. 117 (1971): 67–71; Polt, "Jovellanos and His English Sources," 15-42.

[22] Richard Herr, *Rural Change and Royal Finances in Spain at the End of the Old Regime* (Berkeley: University of California Press, 1989). For appeals to Caroline minister regarding agrarian policy, see "Memoria sobre los medios de facilitar el comercio inerior presentada al Exmo. Señor Conde de Floridblanca por Don Augustin de Betancourt y Don Juan de Peñalver en año de 1792," AHN, Sección Estado, Legajo 3208.

[23] See, e.g., José Moñino conde de Floridablanca, "Memorial presentado a Rey Carlos III, y repetido a Carlos IV, por el conde de Floridablanca, renunciado el ministerio," in *Obras originales del Conde de Floridablanca y escritos referentes a su persona*, ed by. Antonio Ferrer del Río (Madrid: Imprenta de Hernando y compañia, 1899), 307–350, esp. 330.

[*diques*], and known works of public utility."[24] The higher quality of road demanded under Charles III led to the rapid rise in road costs, from 1,000 *reales* under Philip V and Ferdinand VI to near 3,000 *reales* under Charles III.[25] Administrative inefficiency hindered management of the peninsular roadways, slowing repair of the damage caused by increased use. Authority was split between ministers from the treasury (who financed the effort), a minister of roadwork (who organized the project), and the ministry of war (whose military engineers conducted much of the work). Charles III untied these in a 1778 royal decree, giving the conde de Floridablanca total authority over the roads as *Superintendente de Caminos y Posadas*. The progress of Caroline reform was inextricably tied to pragmatic solutions to inefficiencies exposed by the quantification of the Spanish monarchy. Caroline ministers needed data to be collected and analyzed to guide some of their projects of state reform, such as agricultural restructuring and free trade. The relationship between the science of geography and state reform arose because of reformers' need for empirical information describing the current state of the Spanish monarchy to guide practical modifications in governance that would lead to improvements in the economy, imperial defense, and contentment of the citizenry.

The policies detailed above were focused on internal reforms of the Spanish monarchy. Quantification, however, also involved external affairs, and we can find it deployed to monitor encroachment by foreign merchants and military forces. Residents of the Aldudes region in the Spanish Pyrenees, for example, complained throughout the

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[24] Gaspar de Jovellanos, *Obras publicadas é inéditas de D. Gaspar Melchor de Jovellanos*, ed by. Candido Nocedal, vol. 2, 2 vols. (Madrid: M. Rivadeneyra, 1858), 78. "*Esta industria, supuesta la proteccion de las leyes, crecerá siempre á proporcion de los auxilios que le proporcione el Gobierno en canales, caminos, puentes, desagües, puertos, diques, y otras obras de conocida pública utilidad.*"

[25] Michael Crozier Shaw, "'El siglo de hazer caminos': Spanish Road Reforms During the Eighteenth Century. A survey and Assessment," *Dieciocho: Hispanic enlightenment* 32, no. 2 (2009): 424–428.

eighteenth century that French miners were crossing the border and extracting resources from mines within Spain.[26] These Frenchmen were skirting the Spanish taxation system, depriving rural Spaniards of potential wealth, and bringing into question Spanish sovereignty. Caroline ministers needed quantifiable data from the region estimating the number of French miners illegally extracting Spanish resources and the value of the resources being lost to France. Quantification extended to the colonial realm, as well. From his station in the southern Atlantic, for example, Juan Antonio Gastelu sent detailed reports back to Madrid enumerating the passage of foreign ships towards the Straits of Magellan.[27] This was hardly an isolated effort, as Spanish concerns over its control of the southern Atlantic intensified throughout the final decades of the eighteenth century.[28] In Saint Petersburg, the Spanish ambassador was also busy quantifying. As tensions in the northern Pacific escalated between Spain, Britain, and Russia over their competing claims to territorial sovereignty over the region near Nootka, the ambassador sent dispatches to Madrid detailing Russia's collection of maps of the Nootka region as well as Russian possessions in eastern Europe.[29] The 'spirit of quantification' and the data that resulted from it were revealing vulnerabilities in the periphery of empire. Spain's renewed awareness in the Pyrenees, southern Atlantic, and northern Pacific is

[26] "Representación a el Rey Nuestro Señor sobre el dominio en los montes de Alduide. Derechos a el útil, y pasturas de los Valles de Valderro, Valcarlos, Baztan, y Real Casa de Roncesvalles. Violentas usurpaciones de el de Baiguer. Continuos reencuentros, e inquietudes en las fronteras desde el año 1237 hasta el de 1752," 2 May 1752, Pamplona, M-RAH, 11/9371 nº 2.

[27] "Noticia de lo executado en los cinco Islas de San Andres, Santa Catalina, Providencia, Mangles grande, y Mangles Chica por el Comandante de la Fragata Santa Agueda Don Juan Antonio Gastelu," 1789, AHN Diversos-Colecciones,31,N.95.

[28] See, e.g., "Los Nabios Fragatas y Paquebotes son los que Navegan en este Mar del Sur continuante y sinba esta Razon para los fines que combenga al Interesado. Lima 14 de Junio de 1791," AHN DC,32,N.43.

[29] See, e.g., "Mapas que Mapas del Imperio de piden para la secretaria de estado Rusia," 15 January 1796, AHN, Estado, 6122, Legajo 1; "Lista de la Mapas que se han enviado a España," AHN, Estado, 6122, Legajo 2.

representative of a larger pivot in Spanish policy towards increased interest in the imperial periphery. It is to this topic that we will now turn.

Observational Redundancy: Mapping Limits

Beginning early in the reign of Philip V, Bourbon ministers found that conditions in the peninsular periphery were obscured due to the failure of provincial authorities to gather information on their local economy and population. To combat these issues, reformers began to restructure regional authority and centralize state governance, as has been already described. Additionally, by the middle of the century ministers had dispatched a series of expeditions to corners of the peninsula to collect the accurate information on social conditions at the edges of the Spanish monarchy. In order to defend Spain's economic interests in the face of foreign intrusion, however, ministers soon found that they needed to advance arguments layered with both precise mathematical measurements and complex historical evidence. That is, Spanish claims of possession in the periphery were often made not with either mathematical or historical geographic practices, but according to the principles of both. Balancing the perspectives of governmental and local audiences necessitated such redundancy. While European governments were increasingly convinced of territorial sovereignty by cartographic evidence, local residents were not similarly convinced. European governments might acknowledge their respective rights to natural resources in border regions, but residents were inclined to respect traditional means of spatial demarcation and not arbitrary lines corresponding to astronomical coordinates. Thus, even as Spanish ministers attempted to adopt principles of cartographic sovereignty in their diplomatic negotiations, local

communities demanded that traditional methods of declaring sovereignty be preserved. This was especially true of the imperial periphery, where isolated communities had maintained national boundaries in the absence of monarchial intervention. Caroline ministers thus had to create the image of perpetual monarchial presence in the periphery, layering their representations of the boundary with both mathematical and historical arguments. This sort of redundancy was characteristic of Spanish geographic practice, equating the strength of sovereignty to a superfluity of data. The example of the Pyrenean boundary is particularly illustrative of this analysis.

Throughout the eighteenth century, Spanish subjects in the Pyrenees petitioned the government in Madrid to defend their local rights and, by extension, Spanish sovereignty in the region. As Peter Sahlins stated at the beginning of his history of the boundary, the frontier between France and Spain in the Pyrenees is, perhaps, the most static political boundary in Europe.[30] Yet, as Sahlins also notes, the legal façade of permanence hides a history of contestation between the resident communities on either side of the territorial limits. In the eighteenth century, Spaniards living in the Pyrenees petitioned to the Spanish state for defense of their natural resources and relief from taxation systems rendered complicated by geographic indeterminacy.

According to ministerial reflections on the Pyrenean boundary, the confusion in the Pyrenean region had been caused, at least partially, by the lack of recent cartographic certification of the border. A report forwarded to the crown in 1778 by individuals at the Royal Academy of History claimed that legal decisions were informed by the 1619 map created by Juan Bautista Labaña, while significant shifts in control of the region had

[30] Peter Sahlins, *Boundaries The Making of France and Spain in the Pyrenees* (Berkeley: University of California Press, 1989), 1.

occurred in the subsequent hundred and sixty years.[31] In particular, towns in the Valley of Aran had been transferred to Catalonia in 1719. The lack of current cartographic representations for the Pyrenean region was only one source of trouble. In 1757, the "Actas de las Cortes de Navarra" had referenced a report by the marqués de la Ensenada that had suggested that Frenchmen were frequently crossing the border to extract resources from mines on the Spanish side.[32] Not only this, they were operating outside the Spanish taxation system and depriving the Crown of its rights within the '*Quinta Real*.'[33] Confusion centered on the Aldudes mountains, where gold, silver, and copper resources were highly sought.[34] The only solution, according to the 1757 report, was to conduct a comprehensive survey of the region in order to defend monarchial interests.

> In order to let them know that it is so clear and manifest that [the limit] is founded [and] in place, it will be necessary – as I have already seen [suggested] in the responses from the marqués de la Ensenada and General Board for Trade and Mines of 20 October and 10 November – to demarcate the boundaries that divide one Crown from the other, and squeeze the rightful anger [*estrechar en los Justos el ardor*] of the *Baigorrianos*, with stern warnings [to ensure] their observance.[35]

Between 1775 and 1785 Spanish military engineers from the Academia de Matemáticas in Madrid completed an exhaustive survey of the Aldudes region, focusing their charting

[31] "Representación hecho por la Real Academia de la Historia a S.M. para que en los mapas de fronteras no se permita la imp. sin su conocimiento para los perjuicios que pueden causar a los intereses del Reyno," 17 July 1778, M-RAH 11/8266(16).

[32] "Representación a el Rey Nuestro Señor sobre el dominio en los montes de Alduide," 2 May 1752, Pamplona, M-RAH, 11/9371 nº 2.

[33] Ibid., f. 1. The Quinto Real (French: Le Pays Quint) is an area in the Pyrenees mountains that is administered under Spanish sovereignty, but French nationality. As a result of its complex state, residents owe their income taxes to France, but property taxes are paid to Spain.

[34] I have encountered several variants of Aldude, Aldudes, Alduides to reference the area. While my sources most often refer to the *montes de Alduides*, I have chosen to use the contemporary toponym, Aldudes, for the sake of clarity.

[35] "Representación a el Rey Nuestro Señor sobre el dominio en los montes de Alduide," M-RAH, 11/9371 nº 2, f. 5. *Baigorrianos* refers to the residents of Saint-Étienne-de-Baïgorry, a town situated at the primary point of access to the Aldude valley.

effort on the disputed portions of the commune.[36] Spanish military engineers operated throughout the eighteenth century in a manner analogous to the naval efforts, mostly serving civil engineering projects.[37] The Spanish survey had been dispatched in response to the complaints, but it also attempted to verify results of a French survey that had been conducted between 1769 and 1776.[38] Ministers also used the atlas of Jacques Nicolas Bellin to verify locations in the disputed region.[39]

Following the negotiation of a peaceful treaty in 1785, a boundary commission was established under the authority of Antonio de Zara, a Spanish military engineer, and Gaultier de Kerveguen, his French counterpart, containing eight military engineers from each of the two monarchies. The bilateral boundary commission mapped the contested region between 1786 and 1790, producing five richly detailed topographic maps of the region, on a scale of one league per 5600 Castilian *varas* or 2400 *Toises*.[40] The resulting maps were labeled according to the limits negotiated in 1785 and include intricate

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[36] For the resultant maps, see *Relacion de los Mojones [cono]cidos, y comunes que cir[cundan] terminos de los Montes llamados Alduides y al territorio de Rocesvalles y Valcaslos* [map], No scale given, Centro Geográfico de Ejército (CGE), Ar.H-T.5-C.8-233.

[37] For more on military engineers in eighteenth century Spain, see Martine Galland Seguela, *Les ingénieurs militaires espagnols de 1710 à 1803: étude prosopographique et sociale d'un Corps d'élite*, Bibliothèque de la Casa de Velázquez, 40 (Madrid: Casa de Velázquez, 2008), 13–68; Carrillo de Albornoz y Galbeño, *Los ingenieros militares Juan y Pedro Zermeño*, 19–20.

[38] [*Plano original Frances de la Región de los Alduides y Quinto Real para el Estudio de la Delimitación con Notas Francesas de los años 1769-1776 / copiado en 25 de octubre de uno del E.M.S*] [Manuscript map], No scale given, CGE, Ar.H-T.5-C.8-231.

[39] See, e.g., the annotated copies of Bellin's maps of the region in the naval archives: Jacques Nicolas Bellin, *Carte des Environs de Bayonne et les Costes jusqu'a a Fontarabie* [map], No scale given, Paris: 1764, AMN, MN-MN-6708-96; *Carte du Canal de Languedoc Depuis Toulouse jusqu'a l'Etang de Marceillette* [map], No scale given, Paris: 1764, AMN, MN-MN-6708-105; *Coste de Languedoc et Roussillon Depuis Lecaute Jusqu'a Port Vendre* [map], No scale given, Paris: 1764, AMN, MN-MN-6708-100.

[40] *Mapa Topográfico de los Montes Pirineos, Levantado baxo las escala de 6 líneas por 100 Tocsas, De orden de S.M. Catholica El Señor D. Carlos III y de S.M. Christianisima el Señor D. Luis XVI; por ocho Yngenieros Españoles y ocho Franceses de las ordenes de los Comisarios nombrados por las dos Coronas para la Demarcacion de Limites, los Mariscales de Campo D. Ventura Caro y el Conde de Ornano; y baxo la Direccion del Coronel de Yngenieros D. Antonio de Zara y del Teniente Cor. M. Gaultier del Kerveguen* [map], No scale given, 1786-1789, CGE, AR.H-T.5-C.8-237(a,b); AR.H-T.5-C.8-238(a,b); AR.H-T.5-C.8-239; AR.H-T.5-C.8-240(a-d), AR.H-T.5-C.8-241(a,b).

decorations as well as measurements of the altitude of various mountains, suggesting that the maps were meant to be circulated, displayed, and perhaps even sold commercially.

In addition to the many expeditions sent to chart the region utilizing methods of mathematical cartography, the Royal Academy of History provided Caroline ministers with a historical explanation for Spanish sovereignty over the Aldudes Valley in 1778. In a report prepared by the academicians, the history of Lower Navarre is documented beginning with its creation in 1400 during the reign of Charles III of Navarre and ending with the boundary agreement signed by Phillip III and Louis XIII in 1619.[41] The academicians contended that their historical argument demonstrated that neither monarch could have negotiated control over the region in 1619, since it was a historically distinct kingdom and deserving of its own *cortes*. It was on the basis of their historical facts that the academicians recommended that Spain dispatch yet another surveying expedition to the region to show with certainty that the Aldude Valley was the modern site of the historical Lower Navarre. "Without this historical knowledge [the legal claim of Lower Navarre], it is risky [to attempt] to create correct geographical maps."[42] The Royal Academy of History report did not recommend that Spanish surveyors attempt to locate the Aldudes in absolute geographical space, locating the boundary with longitudinal and latitudinal coordinates. Rather, their report suggests that ministers send expeditions to survey and locate the boundary historically.

Caroline ministers did, in fact, have such a map prepared following the 1785 agreement. The map produced by José Vega in 1785 places the Pyrenean limits alongside

[41] Representación hecho por la Real Academia de la Historia […] para los perjuicios que pueden causar a los intereses del Reyno," 17 July 1778, M-RAH 11/8266(16).

[42] Ibid. "*Sin estos conocimientos históricos es arriesgado formar cartas geográficas correctas.*"

the historical boundaries of the frontier.[43] Vega's map – which is much smaller than the elaborate mathematical charts prepared by the military engineers – includes none of the detailed scientific observations available in the wake of engineering surveys. Instead, Vega represents the boundary by giving the viewer a historical outline of the disputed region and evolving boundary, including the 1556, 1614, and 1785 limits. The Vega map is ministerial, meant for the development of policy regarding the region, not empirical like the military engineers, meant to give the reader a richer understanding of the region. Although it lacks the precise representation of the Pyrenean border present in maps prepared according to the observational expeditions conducted by Spanish military engineers between 1775 and 1785, the Vega map presents an equally formidable argument for Spanish authority in the Aldudes region. Through its redundant presentation of Spanish sovereignty along the Pyrenean border, layering colored lines depicting Spanish measurements of the border on top of each other, the Vega map indicates an enduring Spanish presence in the Aldudes. The Vega map does not mobilize the authority of any individual set of measurements, but rather the volume of Spanish measurements, itself, as evidence of unceasing Spanish sovereignty in the region.

By the late-eighteenth century, Caroline ministers were successfully relying on recent Spanish map production to resolve international territorial disputes. While these methodologies were successful as part of their diplomatic negotiations, ministers recognized that in contrast to foreign governments local communities in the Spanish periphery valued a different type of evidence of sovereignty. To convince local communities of the authority of the central government, Caroline minister began to

[43] José Vega, *Limites de España y Francia segun el tratado de 1785* [Manuscript map], No scale given, Madrid, CGE, Ar.H-T.5-C.8-249.

construct evidence of perpetual monarchial presence in the periphery. One solution they utilized was the assembly of cartographic images layered with evidence of the abundant mathematical and historical data collected and consulted by ministers in Madrid.

The Imperial Periphery: Marking Limits

Naval surveyors were startled when the first native inhabitant that they encountered on their 1785 voyage through the Straits of Magellan greeted them in broken Castilian, introducing himself as Francisco Xavier.[44] When Xavier presented the crew with a silver hatchet that bore an engraving marking the reign of Charles III, however, the naval officers realized that this Patagonian native participated in an informal economy with Spaniards from the Viceroyalty of Río de la Plata. When Charles III declared *comercio libre* in 1778, trade with Patagonians had not been an intended consequence.[45] Their encounter with Francisco Xavier forced the Magellan Survey crew to reassess popular conceptions of Amerindians, and, no less, of Spanish trade systems in the southern Atlantic. Despite the occasional European proposal to establish settlement in the Straits, the waterway remained a passageway and not a destination.[46] Ministerial

[44] Vargas Ponce, *Relación*, 20-22. For more on the Magellan Survey, see Chapter Four, pp. 207-211. While Xavier and other Patagonians sat with the crew to eat and smoke, Xavier quickly warned the other Patagonians against drinking wine or spirits to the surprise of the crew. The encounter with a Patagonian that spoke Castilian, even as poorly as Xavier, who could restrain himself from alcohol, challenged the notions of savagery that the crew harbored towards the native population, Ibid., 21.

[45] Susan Socolow notes that the merchants of Buenos Aires increasingly engaged in trade with native populations in the late eighteenth century, but the south was not a part of the three recognized internal trade routes utilizing that port, Susan Socolow, *The Merchants of Buenos Aires, 1778-1810: family and commerce* (New York: Cambridge University Press, 1978), 4; 6-8; Elliott, *Empires of the Atlantic World*, 307, 372.

[46] For an example of Spanish comments on settling the region, see Juan Baptista Muñoz, "De la Navegacion al Mar del Sur", October 12, 1779, f. 27, AMN Ms. 1661, Archivo Museo Naval. For a British example, see Daniel Defoe to Robert Harley, 1st Earl of Oxford, "Proposall for a Settlement Upon The Coast of America", August 3, 1711, defodaOU0010345b_1key001doc, Electronic Enlightenment, http://www.e-enlightenment.com/item/defodaOU0010345b_1key001doc, (accessed March 2, 2011).

fears that metropolitan Spain was losing control of its colonies and their natural resources were being proven frighteningly correct.

Governmental reforms became increasingly focused on peripheral regions of the global Spanish monarchy during the Caroline period. By the 1770s, colonial possessions throughout the Atlantic were dangerously primed for rebellion. Spain in the late eighteenth century was stretched beyond its capabilities, and faced encroaching rival powers from inside and outside of its empire. Additionally, growth in the colonial population sent a larger proportion of Spaniards away from traditional administrative centers and towards the periphery. Population redistribution was accompanied by shifting perceptions of Spanish colonial identity related to Spanish citizenship and participation in the imperial machine.[47] As the colonial administration initially failed to adapt to these changes, tensions rose between Madrid and Spanish America.[48] In Madrid, Caroline ministers debated the most effective means of reforming their colonial policy; however, colonial administrators and government ministers lacked accurate data to inform their decisions. Therefore, scientific voyages during the Caroline period were increasingly directed to the periphery to gather data to inform reform decisions.[49]

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[47] Francisco Ortega, "Ni nación ni parte integral 'Colonia', de vocablo a concepto en el siglo XVIII iberoamericano," *Prismas: Revista de historia intelectual* 15, no. 1 (2011): 15-24; Tamar Herzog, *Defining Nations: Immigrants and Citizens in Early Modern Spain and Spanish America* (New Haven: Yale University Press, 2003), 141-152.

[48] John H. Elliott characterizes the essential quality of Imperial Spain as an ongoing dialogue between center and periphery, see: John Elliott, *Imperial Spain, 1469-1716* (New York: St. Martin's Press, 1964), 32. Anthony Pagden and John Elliott have both discussed the difficulties the Spanish Empire faced maintaining lines of communication due to its immense size, see Anthony Pagden, "Heeding Heraclides: empire and its discontents, 1619-1812," in *Spain, Europe and the Atlantic World: Essays in honour of John H. Elliott*, ed. Richard Kagan and Geoffrey Parker (Cambridge: Cambridge University Press, 2002), 316-333; Elliott, *Empires of the Atlantic World*, 302.

[49] Manuel Lucena Salmoral, "Las expediciones científicas en la época de Carlos III (1759-1788)," in *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, edited by Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Aranjuez: Doce Calles, 1991), 49–63.

Increased scrutiny of the Ibero-Pacific is particularly illustrative of this increased interest by Caroline reformers in peripheral locations within the global Spanish monarchy. This section will explore the increased interest in the Ibero-Pacific by examining two locations: the Straits of Magellan and Nootka.[50] These regions were especially important to the Caroline monarchy for their defensive and economic value.[51] The Pyrenean border towns discussed in the preceding section were mineral rich mining centers, while Nootka lay near a rich sealing and fishing grounds. The Straits of Magellan served as a vital entryway to the Pacific world. Additionally, both Nootka and the southern Atlantic served as important outposts to block off foreign settlement. The defense of Spanish sovereignty in these areas was of paramount interest to Caroline ministers in Madrid.

In what follows I study three episodes that involved geographers taking field measurements in the Ibero-Pacific periphery and the ways they attempted to make non-cartographic sovereignty claims. These geographers were engaged in expeditions of observation for the purpose of producing cartographic evidence of Spanish territorial sovereignty, however these Spanish geographers also understood the importance of historical evidence of Spanish occupation. What is notable about the events described below is the distinct ways that arguments about territorial possession were made in each instance. Still, in each of the three instances described, these historical claims were made as acts of consecration. I argue that consecration was understood by these actors through

[50] For other turns to the periphery, see Vicente Memije's call for increased focus on Manila, as well attention paid to the Caribbean and Gulf Region by Spanish agents. For Manila, see Chapter Six, pp. 265-282.

[51] Spain faced increasing economic pressure from British, French, and Russian merchants entering the Pacific world in the second half of the eighteenth century. For more on this increasing economic pressure, see Elizabeth Mancke, "Empire and State," in *The British Atlantic World, 1500-1800*, ed by. David Armitage and Michael J. Braddick (New York: Palgrave Macmillan, 2002), 186-187.

the lens of Spanish Catholicism to create incontestable and unalterable markers on the landscape declaring perpetual Spanish sovereignty.

These claims are a slight departure from the geographic practices described in previous chapters, which were focused on how the science of geography was used to locate places. Mathematical cartography, such as practiced by naval observers, located places in absolute space, while the historical methods I have associated with the Royal Academy of History located places along a historical axis. The acts of consecration described in this section were not about locating place, but about associating cultural significances to the locations being mapped. If the previously described mapping technologies allowed Spanish ministers to understand where sites were located, these geographical practices gave ministers a purpose for attempting to locate these remote sites.

Bodies and Bottles in the Straits

While conducting land-based observations on February 6, 1786, a small party of naval personnel from the Magellan Survey climbed a hill surrounding the Cabo de San Joseph (sometimes referred to as Cabo Gallant). At the crest of the hill, the party came upon a small monument left by Louis-Antoine de Bougainville during his 1767 passage through the Straits.[52] The central element of Bougainville's monument was a small bottle

[52] There is a great deal of confusion surrounding this event. The official report says that on 24 February a small party encountered a bottle being held in place by some stones, but Córdoba's ship log describes two bottles found on 6 February. Further, Vargas Ponce suggests that the Spanish bottle was placed alongside Bougainville's, while Córdoba is clear that Bougainville's was removed. All accounts note that the landing party made a makeshift cross: Vargas Ponce, *Relación*, 47-48; de Córdoba, "Diario de Navegacion ... [de] Antonio de Córdova ... años de 1785 y 1786," 6 February, 1786. Bougainville does not mention making the monument in his journal, although he mentions exploring the region near Cape Gallant: Bougainville, *The Pacific Journal of Louis-Antoine de Bougainville, 1767-1768*, 27.

containing a message written in Latin detailing his mission.[53] The Spanish sailors removed this paper and replaced it with a message in Spanish describing their current survey and championing the reign of Charles III. Along with the new message, a silver *real* coin was placed inside the bottle and a small crucifix constructed next to the bottle's interment. The hill was christened Cerro de la Cruz. Far from an isolated incident or random occurrence, the use of physical markers of sovereignty was a frequent part of Spanish geographic practice in the periphery. The reader will recall how Spanish agents erected permanent stone markers in the Amazon during the boundary demarcation efforts to adapt to the evolving landscape. In the southern Atlantic and northern Pacific, Spaniards began to use religious symbols and acts of consecration as supposedly incontestable marks of sovereignty to counter the actions of foreigners traveling through the Spanish periphery.

While underway on his 1767 passage, Louis-Antoine de Bougainville and his crew stopped in Cabo de San Joseph in the Straits of Magellan to interact with the local population. Although he never mentioned depositing a bottle, Bougainville did note in his log, with certain sadness, a story regarding death in the bay.[54] While in Cabo de San Joseph, the French crew gifted some trinkets to the assembled Patagonians, a common practice at the time.[55] A young boy, estimated by Bougainville to be between ten and twelve, swallowed a glass marble, causing terrible coughing. Fearing that the marble was harming the boy's stomach, the ship's surgeon gave the boy emetics to no avail; the

[53] For a general overview of the practice of marking sovereignty, see Lauren Benton, *A Search for Sovereignty: Law and Geography in European Empires, 1400--1900* (Cambridge: Cambridge University Press, 2010), 56.

[54] Bougainville does mention, in passing, a group of officers climbing a mountain to conduct surveying operations, Louis-Antoine Bougainville, *The Pacific Journal of Louis-Antoine de Bougainville, 1767-1768*, trans. John Dunmore, 3rd 9 (London: Hakluyt Society, 2002), 27. Bougainville notes in the same passage that his crew encountered many trees engraved by English crews with the year 1767.

[55] Ibid., 29.

French chaplain baptized the child and the crew returned to their ship. As the mission continued onward, Bougainville described hearing wailing at night from onboard the ship, presumably announcing the boy's death. The next day, Bougainville saw Patagonians migrating along the shore and attributed this to their cultural tradition to "flee from a place death has soiled."[56]

In 1786, when the Magellan Survey entered Cabo de San Joseph aboard the *Santa María de la Cabeza*, death again marked the area.[57] Upon entering the bay, Antonio de Córdoba, the captain of the Spanish voyage, noted that the native population was already in flight up the coastline. While climbing the hills surrounding the bay, a search party located the body of an infant. The ship surgeon estimated the child to be less than two years of age, and the crew quickly baptized the child.[58] In his description of the incident, Córdoba observed the Patagonian tradition of abandoning places marked by death, as Bougainville had twenty years earlier.[59] Importantly, this was the very same exploratory party that had located the bottle containing Bougainville's message. According to the accounts of members of the Magellan Survey, it was at this time, by an unhappy coincidence, that a sailor who had been suffering from a quartan fever succumbed to his

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[56] Ibid. Bougainville allows that the Patagonians were prone to flee from "nefarious strangers" who try to destroy them, but reasserts his crew's repeated efforts to save the child.

[57] Vargas Ponce, *Relación*, 47-48; Antonio de Córdoba, "Diario de Navegacion que va a hacer el Capitan de Navio Don Antonio de Córdova sobre la Fragata de S.M. Santa María de la Cabeza con destino a reconocer el estrecho de Magallanes, sondan sus Puertos, Bahias, Calas, y ensenadas Bajos, Planceres, y bancos; Observar los vientos reynantes, y periodo de sus Marneas, examinar los Canales principales, y Levantar los Planos de todo haciendo los observaciones Astronomicos que permita la Intemperie de su situación. Años de 1785 y 1786," 6 February 1786, AMN ms. 0615.

[58] Vargas Ponce notes that the child was given the names of Anthony, Joseph, and Julian: Vargas Ponce, *Relación*, 48. It seems odd that the infant could be baptized post mortem, but the Survey's interactions with a group of Patagonians fleeing the area suggests that the infant had recently passed. The baptism of infants, even in the womb of their recently deceased mother or in cases when they had recently died but had lived for some period of time, was a contentious issue well into the early nineteenth century. For one example in the Spanish-speaking world see José G. Rigau-Pérez, "Surgery at the Service of Theology: Postmortem Cesarean Sections in Puerto Rico and the Royal Cedula of 1804," *The Hispanic American Historical Review* 75, no. 3 (1995): especially 382-383.

[59] Vargas Ponce, *Relación*, 47.

illness. The three incidents were intertwined when the Spanish sailor, Patagonian infant, and a bottle signaling a Spanish territorial claim to the region were buried together atop Cerro de la Cruz.[60] Thus, the cross was more than a simple marker of the bottle's interment solidifying Spanish territorial possession. It was also a religious symbol of the interred bodies.

It is important to understand why Spanish geographers would believe that their actions on Cerro de la Cruz were permanent, while the French marker they had removed was clearly not. Beginning with the fifteenth century voyages of exploration, Europeans relied on physical markers of sovereignty such as stone pillars, wooden crosses, and carvings in tree trunks.[61] Such markers were often destroyed by subsequent voyages from rival nations and decreasingly respected with the continuing rise of cartographic sovereignty. The Spanish actions at Cerro de la Cruz embraced these changes, however. The Magellan Survey produced claims of Spanish sovereignty in multiple manners simultaneously. Their observation of astronomical coordinates during passage through the Straits produced mathematically precise mappings of the region, these observed values and a narrative of the surveying expedition were published and circulated in Europe, and then foreign governments would, presumably, read about the burial of Christian bodies in the Vargas Ponce reports. While stone pillars could be toppled, trees with carving chopped down, and other physical markers removed, it appears that Spanish agents believed a Christian body buried in consecrated ground could not be disturbed. This is why geographers provided Caroline ministers and foreign readers such exhaustive details of the location and significance of the burial atop Cerro de la Cruz.

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[60] Vargas Ponce, *Relación*, 48.

[61] Lauren Benton, *A Search for Sovereignty: Law and Geography in European Empires, 1400--1900* (Cambridge: Cambridge University Press, 2010), 56-58.

These acts of consecration were reaffirmed by the second voyage of the Magellan Survey. During the second voyage in 1789, naval officers traveled through the entire length of the Straits reaching the far edge at Cape Pilares, reclaiming the area for Spain.[62] A bottle was left on an island, christened Isla de la Botella, at the extreme western limit of the Straits containing the following message:

> In the august reign of Carlos III, King of Spain and the Indies.
>
> By order of His Majesty two boats of the Royal Navy left the port of Cadiz in the month of October, 1788 in order to measure all the anchorages, passages, ports and shoals in the Straits of Magellan, creating an exact map to benefit navigation and commerce [in the region]. These vessels being trapped at the Point of Saint Joseph, or Cape Galant, by the fierce winds, two small rowing launches were dispatched along with ten officers charged with completing this important work; and having measured its entirety, they left to posterity this monument for eternal memory. On January 29, 1789: then following were the names of all officers and pilots of the small launches.[63]

The bottle signaled the successful reclamation of the trans-oceanic passage for Spain "for eternal memory." During its return to the Atlantic Ocean, the expedition rested briefly at Cabo de San Joseph. Members of the party re-surveyed the bay, while others collected supplies for the return voyage to Cádiz. The leaders of the expedition deemed it important to also send a party to revisit the Cerro de la Cruz where they "renewed the papers that, in 1786, had been entombed in a bottle on one of the hills of this port, and placed a new cross at the summit."[64] Reclaiming the Straits had entailed simultaneous religious, historical, and scientific acts.

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[62] Ibid., 75; de Cevallos, "Diario ... [de] Ciriaco de Cevallos .. por los años de 1788 y 1789," 28 January, 1788. Cevallos' journal entry for this event is dated January 28, but contains explicit mention of January 29 as the symbolic date the event took place. I am at a loss to explain the discrepancy.

[63] Ibid.; de Cevallos, "Diario ... [de] Ciriaco de Cevallos .. por los años de 1788 y 1789," 28 January, 1789.

[64] Ibid., 86.

Churches on the Map

Spanish geographers also used acts of religious consecration as part of defense of the imperial periphery in the northern Pacific. Unlike the physical markers placed in the Straits of Magellan, Spanish cartographers used the depiction of churches on maps of Nootka circulated as part of diplomatic negotiations to suggest Spanish consecration of the land. In 1790, Great Britain and Spain signed a bilateral treaty ending hostilities in the northern Pacific.[65] The crisis had been born out of Spanish responses to the increased travel of British vessels to the northern Pacific. Fearing encroachment on territory and natural resources, Spain increased its own presence in the area beginning in 1774.[66] Soon, Russian agents were entering the area as well. With the discovery of rich fishing grounds and fur trading in the region, the Spanish outpost in Nootka Sound soon became the premier anchorage in the northern Pacific. Late in 1789, Spanish naval vessels arrived to the Spanish outpost in Nootka to find American and British vessels moored there. In response, the Spanish captain took the British ship and imprisoned its captain. Soon after, the British ship and crew were sent away after being warned to respect Spanish sovereignty. The Spanish and British navies began to prepare for war, but diplomatic negotiations and the use of cartography ended the crisis. At first Spanish agents attempted to defend their claim to Nootka through the invocation of the Treaty of Tordesillas, but

[65] For more on preceding Nootka Crisis, see Rainer F. Buschmann, *Iberian Visions of the Pacific Ocean, 1507-1899* (Basingstoke: Palgrave Macmillan, 2014), 157-159. For the 28 Ocotber 1790 Nootka Convention, see the diplomatic correspondence in AHN Sección Estado, Legajo 2848; AHN Microfilme,Neg.5484.

[66] Notably, this included the Malaspina Expedition. The cartographic evidence that I will draw upon in this brief section was created as part of their voyages.

British diplomats eventually persuaded their Spanish counterparts to concede to the limited applicability of the agreement in the 1790s.[67]

Of interest to this chapter is not the Nootka Crisis, itself, but the Spanish claims of sovereignty put forward over the area. It is clear from ministerial dialogue after 1790 that the primary concerns of Spanish ministers concerning Nootka were the loss of lucrative fishing rights and, more importantly, the precedent it would set for their global monarchy. "[What is] most important, to the [governing] *Junta* and Spain, was the protection of trade throughout the Spanish world, not only in Nootka."[68] Spanish officials felt that the Nootka Convention, which ended the conflict, protected Spanish commercial interests by stipulating that Britain could never settle any Spanish territory where a permanent settlement had been established.[69] Knowing that recent naval expeditions to the region had produced cartographic evidence of settlement, Spanish ministers were convinced of their ability to demonstrate legal rights over the region with this concession. Spanish agents traveling through the region from the 1770s onwards had taken care to map the important inlets of the Nootka Sound, the Straits of Juan de la Fuca, and other potential sites for settlement. Included in each of these maps were precise astronomical coordinates setting the area's exact location, as well as plans including the construction of an

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[67] For more the Treaty of Tordesillas in Nootka, see Salvador Bernabéu Albert, "El Tratado de Limites de 1792. Repercusiones del Tratado de Tordesillas en el Pacifico Septentrional," in *El Tratado de Tordesillas y su Epoca: Congreso Internacional de Historia*, (Valladolid; Tordesillas; Setúbal: Junta de Castilla y León; V Centenario del Tratado de Tordesillas; Comemorações Descobrimentos Portugeses, 1995), Vol. 3:1701–1713.

[68] "Apuntamiento y Noticias posteriores a la Convención firmada 28 de Octubre de 1790 en San Lorenzo el Real, sobre Perea, Navegación, y Comercio en el Océano Pacifico y Mares de Sur," AHN Estado, Legajo 2848, f. 4. "*lo más importancia, para la Junta y su España, fue la protección de la comercio en todo el mundo española, no sólo en el Nootka*,"

[69] Papeles de Don Bernardo de Yriarte, AHN Estado, Legajo 2848. "*En uno de los Artículos secretos de la convención de Nootka se estipulo que los limites averiquos de la América Española se consideren como no existenece y que sólo se estimen como tales los de los territorios donde ahora existen establecimientos Españolas; Que los Ingleses podrán situase en cualquiera pasaje donde no hay avales establecimientos."*

astronomical observatory and a hospital.[70] Frequently, these maps included an image of a church in their depiction of Spanish settlement of the region.[71] By including images of religious, scientific, and medical buildings in the Nootka region, Spanish cartographers were attempting to use the cartographic evidence and a visual record associated with it to satisfy the Roman Law principle of *terra nullius*. It should be pointed out that each of these buildings carried a particular symbolic importance as part of this legal claim of possessing the land. Spanish claims of territorial sovereignty in Nootka were made through precise measurement of the region in cartographic production, something that the image of an observatory reinforced by suggesting an ongoing process of systematically measuring the land. The church also signified permanence, suggesting that Spanish settlers had already completed acts consecrating the ground in Nootka.

The erection of crosses in the southern Atlantic and the depiction of churches in the northern Pacific were acts of religious significance. Spanish naval officers were keenly aware that successive European voyagers might erase acts of political sovereignty from the landscape, yet the Christian consecration of ground were meant to become permanent markers of Spanish sovereignty. These acts of consecration were political statements. The placement of a cross atop the hill in Cabo de San Joseph was a part of Spanish attempts at signaling political control of the region. In Nootka evidence of consecrated ground in the form of a church was used to dissuade the British from encroaching on north Pacific fisheries. At the imperial periphery, Spanish geographers

[70] See, e.g., *Plano del Puerto de Nutka en la Costa N.O. de América, situado en la Latitud N. de 49º,33', y en la Longitud de 21º,21', al O del Meridiano de San Blas, que dista del de Tenerife 88º,50',15" igualmente Occidental* [Manuscript map], No scale given, 1792. Archivo Histórico Nacional Estado,MPD.3; *Carta de la Entrada de S. Lorenzo de Nutka sita en el grado 49 33ms de Lat. N. Y 249 ms Long. del meridº de Tenerife. Las letras ABCD son Rancherías* [Manuscript map], No scale given, 1791. Archivo Histórico Nacional Estado,MPD.5.

[71] See, e.g., *Carta náutica de la isla de Nutka en la costa occidental* [Manuscript map], No scale given, [1785?]. Archivo Museo Naval, MPD, MN-2-D-11.

attempted to use symbols of religious culture to produce cultural significance in long neglected areas. While messages in bottles and construction of religious buildings suggested future Spanish settlement, the burial of baptized bodies was evidence of a concrete past. Such acts of consecration may be understood through the lens of Spanish Catholicism as creating incontestable and unalterable markers on the landscape declaring perpetual Spanish sovereignty. Whether suggestive of future Spanish occupation or evidence of past Spanish possession, during the Caroline period Spanish geographers used historical memory as part of their multi-layered practices in the imperial periphery. These acts were part of a larger pivot in Caroline reform to increased interest in the condition of the imperial periphery, including the Ibero-Pacific and Pyrenean regions.

Conclusion

Writing an essay in 1788 reflecting on Spanish history, Manuel de Abbad y Lasierra criticized the Royal Academy of History and Spanish government for their interest in the past.[72] Bishop Abbad y Lassierra was a member of the Royal Academy of History, where his discovery of forgotten medieval rites allowed Charles III to expand his

[72] "Ensayo diplomático: dispuesto con permiso de S. M. bajo la dirección de la Real Academia de la Historia por […] Manuel de Abbad y Lasierra," 10 Abril 1788. Real Academia de la Historia (RAH), M-RAH 9/3979. A Church reformer and member of the Royal Academy of History, Bishop Abbad y Lassierra would briefly serve as Grand Inquisitor in 1793. "*Si mi objeto fuese únicamente una colección indistinta de monumentos antiguos, y producir obras inéditos, o incompletas; me bastaba el caudal que tengo recogido en diferentes archivos, para amontonar volúmenes indigestos, como hacer otros muchos; pero he mirado siempre este trabajo informe, como poco ventajoso a el progreso de las ciencias en España, y de ningún honor a la Nación, leen los extranjeros nuestras producciones, y creen que los ofrecemos lo mejor y mas selecto que tenemos, (así debía ser, y no asuntos ridículos) y si estas piezas no se producen con el discernimiento y exactitud, que requieren unos documentos tan cansados, y escabrosos, inducen a los que los leen, a formar un concepto muy pobre y desairado del caudal de nuestros Archivos y Bibliotecas; con ser que los manuscritos que hoy día se conservan en ellas, después de tan funestas desgracias y dispersiones, exceden en mucho a cuanto no ofrecen de singular todas sus Diplomáticas, como estoy pronto a demostrarlo; y sin embargo de ser esto cierto, de ninguna Nación se ha dado una noticia tan vala, y perjudicial, de sus manuscritos, como de la de España; con haber sido esta la primera que abrió rumbo a este difícil estudio, y que tiene los documentos que todas, para ilustrarlo*," Ibid., 6v-7.

powers and further centralize the monarchy in Madrid. Still, the Spanish concern with its past was inherently detrimental, Abbad argued, for it stunted the potential for growth offered by scientific research. As we have seen, however, the past was inexplicably tied to Spanish geographic science.

As Spanish reform continued during the second half of the eighteenth century, Caroline ministers were aware that the strongest articulations of territorial sovereignty in the eyes of their European competitors were those made on maps drawn according to the precepts of mathematical cartography and based on astronomical observations. Mapping projects were not the only manner for geographers to participate in the ongoing projects of state reform, however. In addition to the atlas projects of the Royal Academy of History and the Spanish Navy described in Chapter Four, Caroline ministers also used non-cartographic aspects of geographic science as part of their projects of state centralization, the defense of imperial peripheries, and the growth of the imperial economy. While developments in geographic practice in Spain were not exclusively driven by state reform, the concerns of improving governance and reviving the imperial economy did influence certain characteristics of eighteenth-century Spanish geography. In particular, this chapter has argued that reform concerns congealed into a unique and definable geographic vision characterized by three essential components: a pragmatic methodology, observational redundancy, and a focus on peripheral regions. These components have each been explored through select episodes in this chapter. These examples should not be considered an exhaustive listing of the ways this geographic vision manifested in Spanish geographic practice, nor are they wholly representative Spanish geography for the period considered by this dissertation. In fact, these episodes

are important for their exceptionality. These episodes demonstrate the complicated and at times self-contradictory concerns of Spanish geographers and the state reform project to which they were contributed. Geographic reform was not monolithic or uniform, but rather complex and case specific. The episodes described in this chapter show how geographers adapted their practices to accommodate specific challenges they encountered in each locality, especially in the imperial periphery.

The Caroline objectives of state centralization, the defense of imperial peripheries, and the growth of the imperial economy led to the widespread adoption of a 'spirit of quantification' within the state bureaucracy. Caroline reformers such as Jovellanos and Floridablanca utilized a pragmatic approach to reform, relying on rationality, data analysis, and repeated measurement of the Spanish world to direct the reform program. For these ministers, measuring the monarchy entailed quantifying various elements of the realm, including the exhaustive enumeration of the physical size of Spain, the size and distribution of its population, and the scale and vibrancy of its economy.

As the Bourbon monarchy became increasingly centralized, these quantifications exposed monarchial vulnerabilities in the imperial periphery. Whether on the peninsula or in the colonies, Caroline ministers recognized the danger of foreign encroachment and isolation of local populations. Quantification as described above was one manner of increased governmental attention on the periphery, but other efforts to strengthen Spanish identify and possession also developed. Geographers in the field and ministers in Madrid quickly realized that claims of sovereignty in the periphery were most effective when layered with both mathematical and historical evidence. While diplomacy increasingly

required precise cartography as the eighteenth century progressed, residents in the imperial periphery understood local territorial sovereignty in regards to the history of occupation of their region. This chapter has examined episodes in Spanish relations with the periphery, with particular focus on the way religious culture was utilized as part of Spanish identity formation in the periphery. In the next and final chapter we consider some additional uses of religious culture.

Part III
Chapter Six
Representing the '*Mundo Hispánico*': Visions of a Unified Spanish Monarchy

The reform process in eighteenth century Spain, although designed to promote public happiness, unity, and utilitarian governance, also gave rise to contestations over the definition of Spanish identity throughout the Bourbon period. Accordingly, perhaps one of the most curious issues facing eighteenth century Spanish geographers came in defining the object of their study. That is, what constituted Spain? The Habsburg composite monarchy had been, to a certain extent, more easily defined by the reciprocal and historical relationships between monarch and subject. The peripatetic court could regularly make appearances in front of the *corte* of each historical kingdom, where king and subject would take symbolic oaths of responsibility and fidelity. In an era where those historical divisions were being challenged, the authority of the *cortes* eroding, and the court permanently set in Madrid, the question facing Spain and Spaniards was what defined the new, singular Spanish polity?

When the Royal Academy of History began assembling notes for their geographic dictionaries, their view of "Spain" was framed by its historical origins, claiming that the "name Spain clearly derives from the Latin *Hispania* that the Romans called our country [*país*]."[1] Here and elsewhere, however, the Spain in question was the peninsula, that permanent part of the monarchy that stretched back before expansion into the Atlantic

[1] "España," in "Apuntaciones para una geografía antigua y moderna," Real Academia de Historia (RAH) M-RAH 9/6354-56. On the importance of the historical dictionary as a genre of geographic writing, see: Richard Yeo, "Classifying the Sciences," in *The Cambridge History of Science*, ed by. Roy Porter (Cambridge: Cambridge University Press, 2003), 251.

world.[2] By the end of the Caroline period, however, with the Napoleonic Wars concluding, Spain became the "union of all Spaniards of both hemispheres" without distinction, including those from the peninsular territories, the Canaries, the Americas, and the Philippines.[3] Such a conceptualization of a singular Spanish body was not novel to the early nineteenth century constitutional assembly, and advocates for greater unification of the many pieces of Spain's universal monarchy may be found throughout the existing literature on the Bourbon Reforms. This chapter concerns itself with non-governmental, cartographic representations of a united global Spanish monarchy.

Defining the Spanish World

As described in the previous chapter, the Bourbon Reforms effected profound change throughout the Spanish empire, both in state policy and in the lives of Spanish citizens.[4] Just as the declaration of free trade in 1778 liberated merchants in Buenos Aires, who had operated a clandestine market to the southern Atlantic, the establishment of the new Viceroyalty of the Río de la Plata in 1776 recognized the growth of the region as an economic counterweight to Peru.[5] Sugar producers in the Caribbean, meanwhile, faced growing competition from their French and British colonial neighbors. Political and

[2] For a typical treatment of Spanish history as settlement of the peninsula, see Juan Antonio González Cañaveras, *Metodo para aprender por principios la geografia general y particular, antigua y moderna, sagrada y eclesiastica, y la cronologia y esfera celeste y terrestre* (Madrid: En la Oficina de Cano, 1793), 204–217.

[3] Spain, *Constitución politica de la monarquia española, promulgada en Cadiz a 19 de marzo de 1812.* (Madrid: Impr. nacional, 1820), 122; 124–125.

[4] What constituted a "citizen" of the Spanish empire is historically problematic. The status of *vecinos* and *ciudadanos*, for example, were not always equal, while colonial subjects also experienced different status than their peninsular counterparts. Race became a central issue of nationality versus citizenship in the Constitutional *Corte* of 1812. Geographic reform, as previously stated, sought to eliminate such distinctions and create a truly cohesive, global Spanish empire. For reflections on the citizenship question, see: Tamar Herzog, *Defining Nations: Immigrants and Citizens in Early Modern Spain and Spanish America* (New Haven: Yale University Press, 2003).

[5] For a classic social history of this group, see: Susan Socolow, *The Merchants of Buenos Aires, 1778-1810: family and commerce* (New York: Cambridge University Press, 1978).

economic power shifted in the Spanish Caribbean as other colonies challenged the dominance of Cuba, the traditional hub of the Spanish Caribbean.[6] In the Gulf region Spanish possessions experienced rapid growth as well, but encroachment by settlers from Britain, France, and the United State of America created political instability along the Spanish American boundaries in the Gulf. Economic growth, particularly stimulation of the economy through American exports, drove the Cádiz monopoly throughout the eighteenth century. Spanish emulation of the English colonial use of private companies, such as with the *Real Compañía Guipúzcoana* and *Real Compañía de la Habana*, stalled by mid-century as prices rose in the unregulated, monopolistic market. The transformation of the former into the Royal Philippines Company in 1785 was a first step to incorporating the Pacific into the Spanish Atlantic, while also experimenting with a reconfigured model for the private trading company.[7]

In the midst of this process of reform, maps were being produced throughout the Spanish empire. While some maps reflected changes in the trans-hemispheric Spanish monarchy as they had already taken place, other images projected cartographic representations of changes that were yet to come. Importantly, individuals working within the institutional contexts of the Royal Academy of History and the Spanish Navy did not exclusively produce maps of the Spain at this time. Cartographic voices from Spaniards working both inside and outside of the governmental context, from the

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[6] For one recent study of the late eighteenth century Caribbean, see Ma. Dolores González-Ripoll Navarro and Luis Miguel García Mora, *El caribe en la época de la independencia y las nacionalidades* (Morelia, Mexico: Universidad Michoacana de San Nicolás de Hidalgo, Instituto de Investigaciones Históricas, Departamento de Historia Latinoamericana, 1997).

[7] On these companies and the emulation of the English colonial model, see Gabriel B. Paquette, *Enlightenment, Governance and Reform in Spain and Its Empire, 1759-1808* (New York: Palgrave Macmillan, 2008), 100–101; J. H. Elliott, *Empires of the Atlantic World: Britain and Spain in America, 1492-1830* (New Haven: Yale University Press, 2006), 232. For the financial and political structure of the new Philippines Company, see William Lytle Schurz, "The Royal Philippine Company," *The Hispanic American Historical Review* 3, no. 4 (November 1, 1920): 498–499.

metropolis and the periphery, entered into conversation about the status and future of the Spanish empire. The variety and volume of cartographic voices present reflects the special status maps were being afforded as political statements. As Jeremy Black notes:

> To produce a map of the world was and is to offer a statement about the relationship between a people or state and the wider world. This might relate to commercial interests, imperial ambition, geopolitical concern or ethnic consciousness, among other factors.[8]

In the process of mapping, both the presence and the absence of elements of the map are powerful political articulations as natural features and sovereign borders conspire together, through the cartographer's pen, to create a convincing political argument.[9] Indeed, as many colonial subjects petitioned the Crown for greater recognition and the Spanish Monarchy, in turn, attempted to address growing fears of colonial rebellion, visual representations of the empire proved to be especially effective political statements. Within the complex, trans-hemispheric Spanish monarchy, commerce, ethnic consciousness, and political tensions were all addressed by mapping. As we have seen, maps served as Spanish articulations of sovereignty in the southern Atlantic and northern Pacific in the face of foreign encroachment on rich fishing grounds, while maps of the Spanish borders in the Gulf region reflected the rapidly developing relationship between Great Britain and her American colonies. To curtail expansion and protect its boundaries from the United States of America, Spanish geographers even employed indigenous groups as a territorial buffer. Spanish maps recognized the sovereignty of the 'traditional and historical kingdoms' of the Americas – at least on paper – to use the lands attributed

[8] Jeremy Black, *Maps and Politics* (Chicago: University of Chicago Press, 1997), 113.

[9] For more on these claims, see my comments on geography and the state in the Introduction, pp. 8-15.

to these indigenous groups as a bulwark against foreign colonial expansion.[10] Thus, the creation of maps by both individuals and the Spanish government in the late eighteenth century that sought to address tensions in the trans-hemispheric monarchy created a diverse cartographic landscape. While each cartographic vision of the Spanish empire engaged with ongoing economic, political, and ethnic contestations, clearly not every cartographer was concerned with all of these ongoing discussions.

This chapter will focus on two particular visions of Spain and, more so, her empire in the later eighteenth century as reflected in cartography. As has been previously suggested, the nature of maps in Spain was somewhat fluid over the course of the eighteenth century. The innovative maps that will be examined here illustrate the new capability geography had gained as an effective rhetorical tool for making political arguments in Caroline Spain. Vicente de Memije's allegorical reading of the Spanish empire shows how mapping not only reflected political realities, but also suggested political shifts.[11] Memije, studying at a Jesuit university in the Philippines, used allegorical mapping to call for a strengthening of monarchial investment in that colony. Juan Antonio González Cañaveras, by contrast, was an educational reformer whom we can imagine as 'looking outward' from the imperial metropolis when he made his own

[10] The United States and its plenipotentiaries negotiated the delimitation of boundaries with various groups, including the Cherokee, Choctaw, and Chickasaw. Interestingly, the Spanish appear to have recognized larger tracts of land for these groups in order to push back European expansion. See, e.g., Archivo Histórico Nacional (AHN) Estado Proc. Leg. 3898 Sig. MPD.18; AHN Estado Proc. Leg. 3998 Sig. MPD.20.

[11] Vicente de Memije, "Aspecto Geographico del Mundo Hispanico: que a su Glorioso Catholico Rey Carlos Tercero el Magnanimo dedica, y consagra D. Vicente de Memije con IX Theses, y XC proposiciones, que acerca de el defiende presidiendo el R.P. Pasqual Fernandez, publico professor de mathematicas en la Universidad de Manila de la Compañía de Iesus Año de 1761 [map], No scale given. Manila, 1761. Cartoteca, Centro Geográfico de Ejército Ar.J.T.1-C.2-57; Memije, Aspecto Symbolico del Mundo Hispanico: puntualmente arreglado al Geografico, que a su Glorioso Catholico Rey D. Carlos Tercero el Magnanimo dedica, y consagra D. Vicente de Memije, con IX thoeses, y XC proposiciones, que a cerca de el defiende; presidiendo el R.P. Pasqual Fernandez, publico professor de mathematicas en la Universidad de Manila de la Comañia de Iesus Año de 1761 [map], No scale given. Manila, 1761. Cartoteca, Centro Geográfico de Ejército Ar.J-T.1a-C.2a-58.

world map.[12] Cañaveras' map shows an attempt to incorporate scientific data on a map in order to identify larger, overarching patterns in climatic behavior that could be linked to longitudinal and latitudinal values. His devotion to the analytical possibilities of the "line" is especially interesting. Contrasting these very different representations of the Spanish empire sheds light on the wide spectrum of cartographies that existed in Caroline Spain, and shows the noteworthy engagement of Spaniards working outside the state apparatus with conceptualizations of the Spanish monarchy as a united, singular imperial body. Moreover, representations of the global Spanish monarchy in a single image were, in fact, exceedingly rare, making such images particularly striking.

Vicente Memije and the *Aspecto symbólico del mundo Hispánico*

In 1761, two years after Charles III had ascended to the Spanish throne, a young military officer in Manila sent a powerful message to Madrid. Vicente Memije sought to remind the forty-three year old monarch of his loyal subjects in the Philippines and their place in Charles' 'Hispanic world.' This message came in the form of a thesis submitted to the mathematics faculty of the Royal and Pontifical University of the Society of Jesus in Manila.[13] Accompanying this thesis were two maps – the *Aspecto geográfico del mundo Hispánico* and *Aspecto symbólico del mundo Hispánico* – in which Memije reoriented normative perceptions of the Spanish empire and the Philippines' place within it. The first map, the *Aspecto geográfico*, is a rather dry compilation of previously

[12] Juan Antonio González Cañaveras, *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos* [map], No scale given. Madrid: en la Imprenta de Cano, 1800. Biblioteca de Palacio Real (BPR) MAP/85 (29-40).

[13] Vicente de Memije, *Theses Mathematicas de Cosmographia, Geographia, y Hydrographia, en qve el Globo Terraqveo se contempla por respecto al Mvndo Hispanico ...* (Manila: Por D. Nicolas de la Cruz Bagay, 1761).

published images, and is of little interest aside from its peculiar 270º rotated orientation. The second map, however, the *Aspecto symbólico*, makes a powerful and overt political statement to the viewer with its symbolic imagery (See Figure 6.1).

Born and educated in Manila, Memije's mathematical education was influenced by the relative isolation of that colony from the rest of the Spanish empire. While Peru, New Spain, Granada, and the Río de la Plata all saw the introduction of modern thought to their educational institutions, the Philippines experienced a comparatively poor educational standard in the natural sciences.[14] Following the establishment of a chair in mathematics at the University of Manila by the Marquis de Obando in 1750, public disputations were soon held in defense of advanced degrees in mathematics.[15] Still, the topics of the disputations showcase promulgation of the Tychonic and Ptolemaic models of the universe, and theological disputations still grossly outnumbered the mathematical or astronomical defenses. Colonial administrators constantly lamented this lack of educational parity, arguing that 'modern' education was needed to cultivate Filipinos capable of contributing to the *Real Hacienda*.[16] Mathematical education would only

[14] For education in colonial Latin America, see Luis Carlos Arboleda and Diana Soto Arango, "The Theories of Copernicus and Newton in the Viceroyship of Nueva Granda and the Audencia de Caracas during the 18th Century," in *Universities and Science in the Early Modern Period*, ed by. Mordechai Feingold and Víctor Navarro Brotons (Dordrecht: Springer, 2006), 289–309; Manuel Horacio Solari, *Historia de la educación argentina.* (Buenos Aires: Editorial Paidós, 1972), 17–35; Luciano P.R. Santiago, "The Beginnings of Higher Education in the Philippines (1601-1772)," *Philippine Quarterly of Culture and Society* 19, no. 2 (June 1, 1991): 135–145. The Jesuit and Dominican educational structures in the Philippines continued to provide an education based on the Aristotelian-Scholastic tradition.

[15] Horacio de la Costa, "Jesuit Education in the Philippines to 1768," *Philippine Studies: Historical and Ethnographic Viewpoints* 4, no. 2 (1956): 147. De la Costa clarifies some nomenclature, stating that the school was originally called the College of Manila, then College of Saint Ignatius following his canonization, then later the University of Manila or University of Saint Ignatius of Manila.

[16] "*El gobierno de cuenta con testimonio del expediente crecido sobre la extensión de los colegios dotación y falta e ingresos para la cátedra de leyes y mal estudio de la extenúa […]*." Manila, 1 de Abril de 1803. Archivo General de Indias (AGI), Ultramar, Leg. 609.

worsen in the Philippines following Charles III's expulsion of the Society of Jesus in 1767.[17]

Writing in 1803, the governing bodies continued to lament the lack of university chairs in law, medicine, and mathematics.[18] A suggested mathematical curriculum was broken into three tiers of education, each lasting eight months.[19] In the first, students were introduced to "vulgar" arithmetic, geometry, rectilinear and spherical trigonometry, and naval military tactics. In the second course student began to study fortification, calculus, hydraulics, and civil engineering or architecture. The final series of courses covered geography, cosmography, pilotage, and artillery. The greatest needs were, naturally, in the areas of navigation. As a series of islands that provided a vital link between China and the Americas by means of the Manila Galleon to Acapulco, the Philippines suffered, at times, from a lack of trained pilots leading to dependence on foreign pilots. While such a plan was first suggested in the years following the Jesuit expulsion, administrators' note that in 1803 the promise of such an exhaustive curriculum remained unfulfilled.

Although Memije was born and educated outside of Europe, the cartographic methodology he employs is reminiscent of a European style particular to the eighteenth century. The *Aspecto geográfico* and its sibling map, which I will discuss in greater detail

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[17] "Expediente instruido sobre el arreglo y reforma de los estudios de la universidad de Manila en las Islas Filipinas, dotación de sus Cátedras y otras cosas." Madrid, 12 de Febrero de 1831. AGI, Ultramar, Leg. 609

[18] "*El gobierno de cuenta con testimonio del expediente crecido sobre la extensión de los colegios dotación y falta e ingresos para la cátedra de leyes y mal estudio de la extenúa […]*." Manila, 1 de Abril de 1803. AGI, Ultramar, Leg. 609. "*La universidad juzga, no ser conveniente que vengan de España, o de la América a servir las Cátedras de Leyes, pudiendo muy bien desempeñarlas con esmero singular sujetos profesores de aquí [...] y por ultimo conociendo la universidad la falta de las Cátedras de Medicina y Matemática, y la necesidad que hay de ellas, propone lo útil que seria se estableciesen una y otra, la primera de los fondos de la Noble Ciudad, y la segunda de los de el Real Tribunal del Consulado.*"

[19] Ibid. AGI, Ultramar, Leg. 609, 6v-7.

shortly, are products of a style known as armchair or cabinet geography.[20] As we have seen previously, cabinet geographers were not concerned with conducting surveys and conveying a precise representation of the terrain.[21] Sitting in their isolated study, the cabinet geographer reflected on past travel accounts and previous mappings before creating a new map influenced by their compilation of these sources, but not based upon direct observation or personal experience. Cabinet geography, although very popular across Europe, has not typically associated with Jesuit geographers, who were more likely to have spent considerable time collecting detailed astronomical observations for their mappings. This makes Memije's employment of the method all the more interesting, and highlights the importance of the symbolic, not mathematical, aspects of his cartography.

One of the more peculiar aspects of the Memije maps is their rotation along the equator, creating what Ricardo Padrón has termed an "equator-vertical" projection.[22] To create the *Aspecto geográfico*, Memije compiled information drawn from a variety of French, English, Dutch, and Spanish sources to create a map of the world that conforms, roughly, to the Mercator projection. Notably, Memije rotated the image away from the normative orientation centered on the Atlantic Ocean, with the Indies to the far left and the Old World to the far right, instead placing the Old World at the top of his image and the East at the base of the image. This same map then formed the base image of the *Aspecto symbólico*, upon which symbolic elements were overlaid. While it may seem odd

[20] This style – which goes by many different names, including cabinet geography – is most often associated with Jean-Baptiste d'Anville, see Lucile Haguet, "J.-B. d'Anville as Armchair Mapmaker: The Impact of Production Contexts on His Work," *Imago Mundi* 63, no. 1 (January 2011): 88–105. In Spain, the style has been associated with Tomás López and Juan de la Cruz Cano.

[21] For more on cabinet geography, see Chapter Two, pp. 101-103.

[22] Ricardo Padrón, "Allegory and Empire," in *Mapping Latin America*, ed by. Jordana Dym and Karl Offen (Chicago: The University of Chicago Press, 2011), 85.

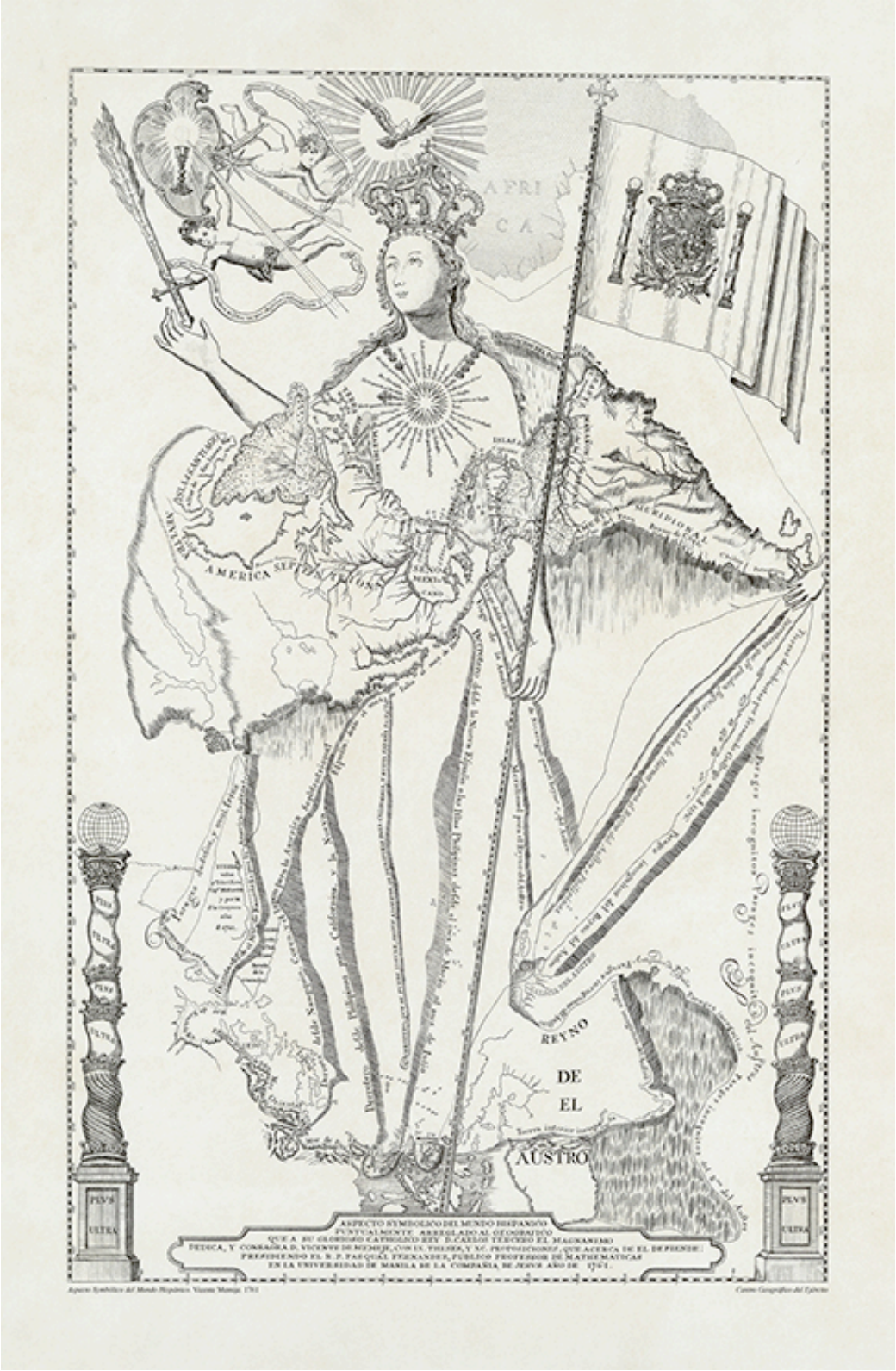

Figure 6.1 Vicente Memije, *Aspecto symbólico del mundo Hispánico* (Manila, 1761).

to the modern eye, this deliberate choice is the first of many tactics used by Memije to reinforce his message of imperial unity. Traditional world maps were printed across many sheets, or on elephant folio that was then folded against itself. For Spanish geographers, this meant that the peninsula was often physically separated from the Americas, each placed on different sheets. The Philippines, far removed in the Pacific, suffered even greater indignities, sometimes shown as an inset image – if included at all. By rotating his projection, however, Memije could challenge this convention, thereby allowing both the *Aspecto geográfico* and *Aspecto symbólico* to be printed on a single sheet.

The creation of a cohesive image of the grand scale of the Spanish empire, including its identification as a "*mundo Hispánico*," was a powerful articulation for unity. Memije reinforces his uniform image of the empire by dissimulating the administrative structures of the colonies. Both the *Aspecto geográfico* and *Aspecto symbólico* challenge the conceptualization of Spain as a composite monarchy constituted by the union of historical kingdoms. In the *Aspecto geográfico*, Memije includes the names of the various kingdoms of the Americas to indicate distinct regions, but erased boundary lines between them.[23] No regional boundaries are shown within peninsular Spain. In the *Aspecto symbólico*, only natural features are labeled, most prominently the Gulf (*Seno*) of Mexico. These deliberate choices serve to reinforce the goals Memije expressed in his *Theses Mathematicas* – reform of the colonial policy, bringing Manila closer to Madrid, and Spanish expansion further into Asia. His call for a united empire was, as will be

[23] He labels Louisiana, Florida, Mexico, Nueva Galicia, Nueva Leon, California, Nueva España, Venezuela, Paraguay, Patagonia, Tierra del Fuego, and Río de la Plata. Curiously, Memije only applies the prefix of kingdom to the "Reyno de Peru" and "Reyno de Chile."

shown in this essay, a reflection on the importance of the Philippines and an indictment of their neglect.

The *Aspecto symbólico* is an allegorical image, layered with emblematic, metaphorical, and theological resonances of Spain and the Spanish empire.[24] The 'Hispanic World' is represented as a crowned female figure with her crown overlaid on the space occupied by the Iberia peninsula. Inscribed on the crown's trim are the names of the historical kingdoms of Spain. Her torso and cape encompass the Americas. The many historical nautical routes (*derrotas*) through the Pacific form the outline of her dress and upon her feet she wears the Philippines as slippers. In addition to her physical form, there are many icons included in the image as well. The female figure wears a compass rose as a necklace. With her left hand, she grasps the equatorial line that serves as a standard upon which the flag of the House of Bourbon flies.[25] Her right hand grasps a flaming sword, inscribed with the biblical verse: "And they will know that God ruleth in Jacob, and over the ends of the earth."[26] Surrounding the sword is a banner containing another verse: "Take this holy sword, a gift from God, wherewith thou shalt overthrow the adversaries of my people."[27] Next to the sword, two angels fly carrying The Host (*la*

[24] My reading of this image is heavily indebted to Padrón and Francisco de la Maza, see: Francisco De la Maza, "'Aspecto simbólico del mundo hispánico.' Grabado filipino del siglo XVIII," *Anales del Instituto de Investigaciones Estéticas* 9, no. 33 (July 30, 1964): 5–21; Ricardo Padrón, "From Abstraction to Allegory: the Imperial Cartography of Vicente Memije," in *Early American Cartographies*, ed by. Martin Brückner (Chapel Hill, NC: University of North Carolina Press; Omohundro Institute of Early American History & Culture, 2012), 35–66.

[25] Note that while the flag shown correlates to the modern flag of Spain, Charles III did not accept this design until the 1780s. That Memije selected the standard that would gain acceptance some twenty years later is coincidental.

[26] *Psalms* 58:14. "*Et scient qui Deus dominabitur Jacob: & finium terra*." It is noteworthy that both Biblical verses written on the *Aspecto symbólico* are abridgments of their cited verses. Further, contemporary liturgy cuts Psalm 58 at verse 11. Therefore, the translations offered here are my own and I have used the Vulgate to verify my transcription. See: *Biblia sacra: iuxta Vulgatam versionem* (Stuttgart: Deutsche Bibelgesellschaft, 1994).

[27] *2 Maccabees* 15:16. "*Accipe sanctum gladium munus a Deo quo deicies adversaries populi mei*."

Sagrada Forma), and above the female form's head is a symbolic representation of the Holy Ghost as a dove (*la paloma*). Finally, the Pillars of Hercules stand in the lower right and left corners of the image wrapped with the Habsburg Spanish motto *Plus Ultra*.[28]

The choice to represent the Spanish empire as a singular, unified female body is striking and important. In his *Theses*, Memije builds on the anthropomorphic nature of his representation to defend the unity of the Spanish world. Although it spans multiple continents and crosses two vast oceans, Memije sees the empire physiologically unified, saying that galleons travel her many *derrotas*:

> like the blood, which, circulating through the veins, communicates to all the members of the body the vital spirits, and as they navigate through all the seas, to bring to the New World judges who administer justice, scholars who protect reason [*la razón*], captains who defend the faithful vassals, [and, finally,] Bishops, and all the ecclesiastical hierarchy, that preserve and promote the rites of the Catholic religion.[29]

This unity stems from the "soul of the Hispanic World, the Catholic Religion."[30] The comparison of the soul of the Spanish monarchy with Catholicism reflects a tradition of devotion to the Virgin Mary in Spain.[31] It further supports the symbolic imagery of the *Aspecto symbólico*, which is reminiscent of the portrayal of the Virgin Mary as 'Mary,

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[28] For more on the symbolism of the Pillars of Hercules as related to Spanish identity, see Earl Rosenthal, "Plus Ultra, Non plus Ultra, and the Columnar Device of Emperor Charles V," *Journal of the Warburg and Courtauld Institutes* 34 (1971): 204–228; Ricardo Padrón, "Mapping Plus Ultra: Cartography, Space, and Hispanic Modernity," *Representations* 79, no. 1 (August 1, 2002): 28–60.

[29] Memije, *Theses Mathematicas*, 7. As quoted in Padrón, "From Abstraction to Allegory: the Imperial Cartography of Vicente Memije," 58. "*Díganlo tantas y tan gruesas escuadras que, como la sangre que, circulando por las venas, comunica a todos los miembros del cuerpo los espíritus vitals, así ellas navegan por todos los mares, para llevar al Nuevo Mundo jueces que administren justicia; letrados que protejan la razón; capitanes que defiendan a los fieles vasallos; obispos y toda la jerarquía ecclesiastica que conserven y promuevan los ritos de la Católica religión."*

[30] Memije, *Theses Mathematicas*, 2. As quoted in Padrón, "From Abstraction to Allegory: the Imperial Cartography of Vicente Memije," 58.

[31] This tradition might be traced back to Ferdinand, who was a zealous devotee of the Virgin. Devotion to the Virgin took on many different forms in Spain and its empire. For more on local practice, see William A. Christian, *Local Religion in Sixteenth-century Spain* (Princeton: Princeton University Press, 1989); Elliott, *Empires of the Atlantic World*, 196.

Queen of Heaven' that was famously depicted by Diego Velázquez in the 1630s.[32] This work hung in the Alcazar and would certainly have been a familiar image to Charles III. The concept of Spain as a unified polity is thus supported by this religious culture and the suggestive image of the Virgin. The visual metaphor suggests that while the various territories that constitute the global Spanish monarchy might physically be separate pieces of land, their shared religious and cultural values transform these distinct pieces of land into a singular, corporeal representation of Spain.

This representation of the empire as female body having physical corporeal integrity is reminiscent of both classical and contemporary political treatises, such as in the *Politics* of Aristotle and Thomas Hobbes' *Leviathan*.[33] Medical works from Spain's Golden Age by Juan Huarte, Montana de Monserrate, Andrés de Laguna, and Cristóbal Pérez de Herrera have also been tied to the anthropomorphic representation of the 'body politic.'[34] In Caroline Madrid, the weekly periodical *El Censor* also invoked the corporeal metaphor in a 1787 condemnation of Spanish political economy, suggesting the diseased body politic required medical evaluation.[35] It is, of course, unclear which of these works, if any, Memije would have read during his Jesuit education in Manila. Still, there is a notable contrast between Hobbes' famous frontispiece of a male monarch clutching a sword and a crosier with Memije's image of a female monarch clutching a sword and the

[32] Diego Rodríguez de Silva y Velázquez, *La Coronación de la Virgen*, Oil on canvas, 1636 1635, P01168, Museo Nacional del Prado.

[33] For a discussion of the Aristotelian and Hobbesian metaphor in the Enlightenment, see Jonathan M. Hess, *Reconstituting the Body Politic: Enlightenment, Public Culture and the Invention of Aesthetic Autonomy* (Detroit: Wayne State University Press, 1999), 83–96.

[34] For more on these authors, see the analysis of Antoine de Baecque: Antoine de Baecque, *The Body Politic: Corporeal Metaphor in Revolutionary France, 1770-1800* (Stanford University Press, 1997), 87–90. For more on French use of the body metaphor, see Jacob Soll, "Healing the Body Politic: French Royal Doctors, History, and the Birth of a Nation 1560-1634," *Renaissance Quarterly* 55, no. 4 (2002): 1259–1286.

[35] *El Censor, discurso 157* (14 June 1787) as cited in Jorge Cañizares-Esguerra, "Eighteenth-Century Spanish Political Economy," in *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World* (Stanford, Calif: Stanford University Press, 2006), 110.

national flag. There also exists precedence in the history of cartography for the corporeal representation of a nation or empire. Ricard Padrón examines Memije's map in the context of Johannes Putsch's *Europa Regina* (1537), which depicts continental Europe as a crowned female figure.[36] Padrón concludes that "*Aspecto symbólico* does indeed look like a throwback, resembling allegorical maps from the sixteenth century [….] more than it does the carefully surveyed, meticulously engraved maps and charts of the Age of Enlightenment."[37]

In light of Memije's attempts to influence the colonial policies of Charles III, it may be more appropriate to conclude that Memije utilizes the cartographic metaphor of a body politic, familiar to Charles as an educated, enlightened absolutist monarch, to strengthen his case for unity within the Spanish empire. In combining the body politic metaphor of *Europa regina*, in general, with the Spanish association of their monarchy with the Virgin, in particular, Memije speaks directly to his king, arguing for greater unification of the Spanish world. More specifically, by invoking a body Memije was arguing against parceling out tracts of land or separating elements of the monarchy since these would destroy the corporeal integrity of the woman/Spain.

Memije further strengthens his argument for a unified, cohesive Spanish empire by associating the *mundo hispánico* as depicted as a female figure in the *Aspecto symbólico* with two specific Biblical queens, namely Esther and Judith.[38] Notably, both are Jewish queens playing into longstanding associations of the Spanish nation with the

[36] This image became something of a trope. Another famous example is that of Sebastian Münster, included in editions of his *Cosmographia* beginning in 1588.

[37] Padrón, "From Abstraction to Allegory: the Imperial Cartography of Vicente Memije," 35. Padrón's narrative of a monolithic Enlightenment is somewhat inaccurate. Progress in the eighteenth century was gradual and meandering, not linear and expedient.

[38] For a much more detailed and exhaustive study of the iconographic invocation of Esther and Judith by Memije, see De la Maza, "'Aspecto simbólico del mundo hispánico.' Grabado filipino del siglo XVIII," 10–12.

nation of the Biblical Israelites.[39] While Memije only mentions Esther by name and cites no specific Biblical passage, her story contains themes of opulence, court deception, and practical rule. The Book of Esther centers on King Artaxeres, his wife Esther, a Jew, and his minister Haman, who advocates for the killing of all Jews after claiming their adherence to religious laws make them 'disloyal' subjects.[40] Following the exposure of Haman's cruel nature, Artaxeres reforms his governance and reduces all his subjects to a common set of laws. Since Memije does not cite specific verses from the Book of Esther, we can only speculate as to his intent in invoking Esther's name. However, Charles III might have found a letter from King Artaxeres evocative of the message of Spanish unification Memije was attempting to deliver to Charles III:

> Having become ruler of many nations and master of the whole world (not elated with presumptions of authority but always acting reasonably and with kindness), I have determined to settle the lives of my subjects in lasting tranquility and, in order to make my kingdom peaceable and open to travel throughout all its extent, to restore the peace desired by all people.[41]

While Memije does not cite specific verses from the Book of Esther, he does explicitly identify Spain with her, recalling "the most sublime ornament of the mysterious Esther, the Catholic religion."[42] Queen Esther is an icon here, warning of possible decline with the Spanish empire if its many distant possessions remain disconnected. This was a message to Charles III to rule both fairly and wisely.

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[39] For this, I am reliant on the work of Adam Beaver: Adam G. Beaver, "A Holy Land for the Catholic Monarchy: Palestine in the making of modern Spain, 1469-1598" (Ph.D., Cambridge, Massachusetts: Harvard University, 2008), 108–171.

[40] On this final point, see *Esther 3:8*: "Then Haman said […] 'There is a certain people scattered and separated among the peoples in all the provinces of your kingdom; their laws are different from those of all other people, and they do not keep the king's laws, so that it is not appropriate for the king to tolerate them."

[41] *Esther* 13:2. Unless otherwise noted, my biblical transcriptions follow *The HarperCollins Study Bible: New Revised Standard Version, with the Apocryphal/Deuterocanonical Books*, 1st ed. (New York, NY: HarperCollins, 1993).

[42] Memije, *Theses Mathematicas*, 8. "*el más sublime ornato de la misteriosa Esther, la Católica religón […]*"

Judith, likewise, is a heroine of the Jewish people. The Book of Judith tells the story of Judith, a beautiful Jewish widow, at a time when the Nation of Israel has lost faith in their eventual deliverance from bondage. Judith, along with her maid, goes to the camp of the enemy general Holofernes, and seduces him. Alone with the enemy general in his tent,

> [s]he went up to the bedpost near Holofernes' head, and took down his sword that hung there. She came close to his bed, took hold of the hair of his head, and said 'Give me strength today, O Lord God of Israel!' Then she struck his neck twice with her might, and cut off his head.[43]

With this parable of seducing and then decapitating an enemy of the Jewish people in mind, it becomes apparent something is missing from the *Aspecto symbólico*: the Papal Line of Demarcation from the Treaty of Tordesillas. In 1750, under the Treaty of Madrid, this line had been renegotiated, so Memije is depicting a new world for Spain where both the Atlantic and Pacific territorial claims are no long subject to disputes over the placement of this line. Further, had the line been included in Memije's allegorical image, it would literally cut off the head of the Spanish empire. That is, this line, that had only been suspended a decade prior, would decapitate Judith just as she had decapitated her enemies in the Bible.

In addition to the argument for a singular, coherent Spanish empire, Memije makes an equally passionate case for the importance of the Philippines to that empire. In part, this case is made through another reference to the Book of Judith. As described before, the female figure in the *Aspecto symbólico* wears the Philippine islands as slippers. Part of Judith's seduction of Holofernes and his men is attributed to her rich dress. "Her sandal ravished his eyes, her beauty captivated his mind, and the sword

[43] *Judith* 13:6-8.

severed his neck!"[44] This message is supported, as well, by a passage Memije explicitly cites from the Book of Daniel: *Daniel 2:31-35*. In this passage, Daniel informs King Nebuchadenezzar – Holofernes' master – of a vision he has had:

> You were looking, O king, and lo! there was a great statue. This statue was huge, its brilliance extraordinary; it was standing before you, and its appearance was frightening. The head of that statue was of fine gold, its chest and arms of silver, its middle and thighs of bronze, its legs of iron, its feet partly of iron and partly of clay. As you looked on, a stone was cut, not by human hands, and it struck the statue on its feet of iron and clay and broke them into pieces. Then the iron, the clay, the bronze, the silver, and the gold, were all broken in pieces and became like the chaff of the summer threshing floors; and the wind carried them away, so that not a trace of them could be found.[45]

By citing these verses Memije is arguing that if the Philippines were to remain neglected the entire Spanish empire might soon crumble. The Philippines were, in the mid-eighteenth century, still a part of the Viceroyalty of New Spain, centered in Mexico. In Memije's view, this arrangement did not benefit the Philippines or the empire.[46] Citing specific Biblical passages referencing Esther and Judith, Memije uses the map as a space to argue for the importance of the Philippines to the Spanish monarchy. First, in reference to Esther, Memije sees the Pacific world as untapped and disconnected from Madrid in 1761. Memije argues that Charles III must bring all his subjects close to his heart and secure his claims in order to "fulfill the absolute and ecumenical sense of *Plus Ultra* of the Pillars of Hercules."[47] This claim is supported through Memije's inscription of *Psalms* 58:14 on the flaming sword, proclaiming that the rule of the *mundo Hispáncio* will extend to the "ends of the earth."[48] Second, in reference to Judith, Memije suggests

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[44] *Judith* 16:9. It is useful here to reflect back upon the verses inscribed on the sword in the *Aspecto symbólico*, *Pslams* 58:14 and *2 Maccabees* 15:16. For these verses, see footnote 26 and 27.
[45] *Daniel* 2:31-35. The full dream continues through verse 45.
[46] Memije, *Theses Mathematicas*.
[47] De la Maza, "'Aspecto simbólico del mundo hispánico.' Grabado filipino del siglo XVIII," 5.
[48] *Psalms* 58:14. For the full verse, see footnote 26.

that the Philippines were too isolated from their monarch, enticing foreign invasion as Judith's sandals had "ravished" Holofernes' eyes. Lastly, if the Philippines continued to suffer, the Spanish monarchy itself would suffer. The implication of Memije's argument was that should the Philippines crumble, then, like in Daniel's dream, the whole monarchy might crumble as well. In creating a map depicting the global empire on a single sheet of paper, Memije was calling on the imperial metropolis to invest in its distant possessions in the Pacific world.

Additionally, there is a third menacing hand depicted in his *Aspecto symbólico* that has not yet been explained. On the far right of the image, deep in the southern Atlantic, a third, detached limb enters the image, partially aligning with the Straits of Magellan.[49] As he did elsewhere on the map, Memije draws the routes of notable voyages that passed through the region as well as routinely occurring commercial convoys.[50] In the eighteenth century, the Philippines remained dependent on the Manila galleon that would supply the colony by way of Acapulco on the western coast of New Spain. This trade route was a vital link between Madrid and China, but the biannual voyages slowed communication. Memije was hardly alone is expressing dissatisfaction with the present connections between the East Indies and the peninsula. In fact, many within Spain saw foreign encroachment as well as new systems of trade in the southern Atlantic as

[49] De la Maza argues that this hand is the 'hand of God,' De la Maza, "'Aspecto simbólico del mundo hispánico.' Grabado filipino del siglo XVIII," 18. As I will argue in short order, it is better thought of as the hand of European competitors.

[50] There are two notable inscriptions in the region of the Straits. One summarizes Spanish claims that Hernando Gallego had discovered the *Terra Australis* a series of islands in the south sea during his 1576 voyage, while the other indicated a route that could be followed around Cape Horn to reach the Phillipinnes and south sea ports. "*Derrotera que se puede seguir por el Cabo de Hornos para el Reyno de Austra y Philipinas.*"

requiring changes in the Manila galleons to strengthen Spanish ties to the region.[51] Chief among these threats were increasing French and British voyages through the Straits, the occupation of the Malvinas Islands, and seal hunting by British merchant vessels in the region.[52] One leading figure urging for changes in the Manila galleon system was Juan Baustita Muñoz, whose ideas seem to echo the message of the Memije map.

Juan Baustita Muñoz (1745-1799) is an example of the intellectual shift in Spain during the Caroline era discussed throughout Part III. Initially educated at the Jesuit seminary in Valencia and subsequently at the University of Valencia, where he became a lecturer, Muñoz was a harsh critic of Scholasticism and an energetic proponent of 'modern' philosophy. In 1770, Charles III named him *Cosmógrafo mayor de Indias*, a position whose duties had become somewhat vague with the reform of the Spanish Atlantic system. With the cartographic functions of the *cosmógrafo* now invested in the navy, Muñoz redefined the office when he undertook a number of projects related to the history and political economy of the Indies, including the establishing the Archive of the Indies and analysis of efficiencies in Spain's trade in the Atlantic and Pacific.[53]

In his notes on navigation through the southern Atlantic, Muñoz was critical of the slow progress that had been made in advancing Spanish trade to the Far East. While

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[51] Calls to reform the Manila galleons included suggestions to change the frequency of voyages, change the path taken by the ships, eliminate the dependence of Manila on merchants in Acapulco. For one example, see Juan Baptista Muñoz, "De la Navegacion al Mar del Sur," 12 October 1779, AMN ms. 1661. Muñoz suggested three methods to connect the Atlantic and Pacific Oceans: the Straits of Magellan, Cape Horn, and a passage through the Isthmus of Panama.

[52] The Straits had been a focal point of the Ibero-Atlantic world since the early sixteenth century. While sailing in service to the Castilian crown, the Portuguese explorer Ferdinand Magellan completed the first passage of the Straits in 1520, forever linking his name to the region. The Straits were subsequently passed and charted by Pedro Sarmiento de Gamboa, a Spaniard, in 1579 while in pursuit of Sir Francis Drake. Sir Thomas Cavendish (1587), Captain James Cook (1768), and Louis-Antoine de Bougainville (1764) led other notable voyages through the southern Atlantic.

[53] For more Muñoz and the Archive of the Indies, see Nicolás Bas Martín, "Juan Bautista Muñoz (1745- 1799): un ilustrado valenciano, autor de la 'Historia del nuevo mundo' y fundador del Archivo General de Indias," *Estudis: Revista de historia moderna*, no. 26 (2000): 252–256.

navigational technologies made the trip around Cape Horn or through the Straits of Magellan dangerous and ill advised in the sixteenth century, Muñoz noted that new navigational technologies had made the voyages comparatively comfortable.[54] In this way, he saw the insistence on retaining the Manila galleon trade as an anachronism that ought to be cast aside:

> Only the severity with which foreign ships have been treated along our southern coasts has curtailed (*retraído*) the navigation of merchants of various nations. Meanwhile we, even with this window of security, neglect to properly cultivate a possession capable of producing so many benefits (*frutos*). All the while the French sent Registers, there were no few Spaniards, who by imitating the French traded directly with Peru. Later, and because of the power of the return of old concerns, the flow of commerce returned to raise the fleets and galleons. No less forgotten was the transit around Cape Horn, when, in 1739, the Regular Course of Trade (*Curso Regular del Comercio*) was cut in large part, we sent [ships] to Lima, as Peru was suffering from shortages of clothing and other European goods. Hence, the successful expedition of three ships sent from Cádiz to Callao in 1743 was an example that once again opened the door to direct trade in the Pacific, which has continued subsequently without any corresponding activity or excessive contributions from the Consulate of Lima. But this has not been extended to the Philippines, as demanded by good politics and the best interests of those islands, a thousand times vulnerable to be forgotten by their utter dependence on the scarce and sluggish recourse to New Spain.[55]

Muñoz acknowledges the historical roots of Pacific trade, which form the interior of the dress of the *Mundo Hispánco* as depicted by Memije. Further, both Muñoz and Memije argue that the solution to these problems is trade through the southern Atlantic, creating a

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[54] Muñoz, "De la Navegacion al Mar del Sur," 4.

[55] Ibid., 19–20. "*Solo el rigor con que son tratadas las naves extranjeras sobre nuestras costas del sur ha retraído de su navegación a los comerciantes de varias naciones. Entretanto nosotros, aun con la ventana de la seguridad, descuidamos de cultivar debidamente una posecion capás de producir tantos frutos. Mientras los Franceses enviaron Registros, nunca faltaron Españoles, que a imitación de ellos comerciasen directamente con el Peru. Mas luego obro la fuerza de las antiguas preocupaciones y volvieron las aguas del comercio al izado, y unico causo de Flotas, y Galeones. Poco menos que olvidado estaba el transito por el Cabo de Horn cuando en 1739 cortado en gran parte el Curso Regular del Comercio, nos lo acordó la Lima escaces que padecía el Peru de Ropas, y otras Géneros Europeos. De aquí lo feliz expedición de tres navíos dirigidos al Callao desde Cadiz en 1743 ejemplar que habrio nuevamente la Puerta de la Contratación directa en el Pacifico, la cual ha continuado posteriormente aun que no con la correspondiente actividad o por las excesivas contribuciones del Consulado de Lima. Ni se extendió a las Filipinas según pedía la buena política y el bien de aquellas Islas mil veces expuestas a perderse por depender enteramente del escaso y perezoso recurso de Nueva España.*"

direct trade linking Cádiz to Manila. The root of the problem, according to Muñoz, had historical origins with the blame lying with the administration of Philip II, under whom the galleon system had been codified setting a limit on travel and adding to Seville merchants' monopoly. "Now is not the time to sleep," proclaims Muñoz,

> foreigners carry forward their ancient machinations invented [*univentadas*] for our ruin. We will easily be able to, not only avoid them, but also to punish these ingrates, by no more than to set our sights on the political errors that we have committed, and to seek their amendment by all means. Agriculture, arts, commerce, these are the natural methods, well known, and easily revived [*repracticar*] in Spain, where there is room for them and plenty of ingenuity.[56]

It is unclear whether Muñoz read Memije's thesis, but his argument for a stronger connection between the peninsula and Pacific colonies certainly resonated with Muñoz.[57] Memije was confident that the passage through the Straits of Magellan was the most efficient route for new trade. Additionally, Memije noted the perilous state of Spanish control of the region by depicting a floating hand there to illustrate dangerous, ongoing foreign encroachment. Muñoz was also a proponent for reforming Spanish trade with the Philippines, arguing at times for the development of Spain's possessions in the southern Atlantic and at other times suggested constructing a pathway through the Isthmus of Panama.[58]

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[56] Ibid., 21–22. "*No es aora tiempo de dormir. Los Estangeros llevan adelante sus antiguas maquinas univentadas para nuestra ruina. Podremos fácilmente, no solo evitarla, sino también castigar a estos ingratos, sin mas que poner la vista en los yerros políticos que hemos cometido, y procurar la enmienda por todos medios. Agricultura, artes, comercio, estos son los medio naturales, bien conocidos, y bien fáciles repracticar en España donde están de sobre el terreno, y el ingenio.*"

[57] Memije is not listed among the inventory of Muñoz's library prepared by Bas Martín, but this does not preclude the possibility that Muñoz would have had access to the work as *Cosmógrafo de Indias*. Other authors mentioned earlier, notably Thomas Hobbes, are present in Muñoz's collection, see: Nicolás Bas Martín, "Una aproximación a la biblioteca del ilustrado valenciano Juan Bautista Muñoz (1745-1799)," *Saitabi* 48 (1998): 136.

[58] While he articulated this view in his earlier works, it would be expressed most clearly as an independent treatise in: Juan Bautista Muñoz, *Sobre la empresa real de unir el océano Atlántico con el Pacífico por el Istmo de Panamá* (1786).

Despite his highly evocative cartography, virtually no biographical details about Vicente de Memije survive. It is known that he was creole, born and living in Manila, however details regarding his ultimate fate escape the historical record. Still, his voice, both ethnically and geographically peripheral within the Spanish empire, has survived through his cartographic production. There is, of course, a question associated with a figure such as Memije. Were the views he expressed widespread, either in Manila or among creoles? His argument for a singular, cohesive empire is at odds with the normative narrative of creolism in the late colonial period.[59] This narrative argues that during this time most American creoles were articulating for their independence and greater autonomy. Yet, Memije in contrast sought unity and to strengthen ties with the metropolis. It is noteworthy, nonetheless, that from Madrid to Manila, from *Cosmógrafo mayor de Indias* to a student of the Royal and Pontifical University in Manila, there was a shared belief in strengthening the empire through unification.

Juan Antonio González Cañaveras and the 'Analytical Line '

Other attempts to cartographically represent a unified Spanish world relied not on allegory, but instead appealed to reformers interest in practical governance. In 1800, Juan Antonio González Cañaveras, an educational reformer, published *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos*, a short treatise on geography

[59] See, e.g., D.A. Brading's contention that reform of the Spanish Atlantic system led to the "permanent alienation of the creole elite" by peninsular Spain. "The vogue in Madrid for the terms metropolis and colonies brought small comfort to territories which formerly had been defined as the overseas kingdoms of a universal Christian monarchy. For many American Spaniards the economic prosperity of these years […] was no consolation for exclusion from public office." D. A. Brading, "Bourbon Spain and its American Empire," in *The Cambridge History of Latin America*, ed by. Leslie Bethell, vol. 1 (New York: Cambridge University Press, 1984), 438.

accompanied by a world map.[60] Despite the richness of this map, historians of geography and cartography have largely ignored Cañaveras.[61] Indeed, he is best known for his work on pedagogy.[62] In 1767, Juan Antonio González Cañaveras was appointed by Charles III as director of the Seminary and Academy of Language and Science in Cádiz. Soon after, he published a comprehensive curriculum covering linguistic, geographic, historic, and scientific education, which quickly received approval from the Council of Castile.[63] Between 1775 and 1807, Cañaveras continued to publish treatises devoted to these and other subjects, and was named a member of the Real Sociedad Bascongada y Sevillano. Overall, Cañaveras's work may be connected to a larger educational movement to incorporate the ideas of European philosophers in Spanish schools and spread enlightened ideals.

In 1793, Cañaveras published his major geographical work, *Método para aprender por principios la geografia general y particular*.[64] Begun in the 1770s, this work featured charts and figures prepared by Andrés Muela and Cipriano Maré, two celebrated Spanish engravers. In the *Método*, González Cañaveras notes the influence on his work of Tomás López, Charles III's royal geographer, also mentioning the influence of the French geographers Joseph Nicolas de l'Isle, Philippe Buache, and Rigobert Bonne. González Cañaveras published the *Método* before accounts of Northwestern

[60] Juan Antonio González Cañaveras, *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos* (Madrid: en la Imprenta de Cano, 1800).

[61] One exception is W. Michael Mathes' introduction to a reissued edition of the *Planisferio* published in 2009, see W. Michael Mathes, "Juan Antonio Gonzalez Cañaveras y Su Obra," in *Planisferio ó carta general de la tierra: Madrid 1800* (Madrid: Ediciones José Porrúa Turanzas, 2009), 11–19.

[62] For more on González Cañaveras as educational reformer, see Maria Eugenia Fernández Fraile, "Juan Antonio González Cañaveras y la enseñanza de lenguas en el siglo XVIII," *Documents pour l'histoire du français langue étrangère ou seconde* 42 (June 1, 2009): 87–108.

[63] Juan Antonio González Cañaveras, *Plan de educación rexposición de un nuevo methodo para estudiar...* (Cadiz: Manuel Espinosa de los Monteros, 1767).

[64] Juan Antonio Gonzalez Cañaveras, *Método para aprender por principios la geografia general y particular, antigua y moderna, sagrada y eclesiastica, y la cronologia y esfera celeste y terrestre* 5 vols. (Madrid: en la Oficina de Cano, 1793).

exploration during the Nookta Crisis (1790) could be fully incorporated by non-governmental geographers; accordingly, his depiction of this region remains crude. Cañaveras also represents the Arctic in the *Método* in accordance with the belief that a northern passage would connect Western Europe to Asia. Such imaginative or fantastical aspects of Cañaveras's geography are further demonstrated in his representation of Fusang (*Fusan de los Chinas*) to the west of New France.[65] While Rigobert Bonne, in particular, advocated for the abandonment of decorative flourishes for greater empiricism in eighteenth century cartography, González Cañaveras's attempt to imitate Bonne, Joseph Nicolas de l'Isle, and Philippe Buache showcases a hypothetical cartography wherein uncharted stretches are extended without evidentiary support.

The *Planisferio* of 1800, much shorter than the five-volume *Método*, is not merely an abridged version of this earlier work. Rather, it represents González Cañaveras's attempt to push forward the limits of geographic science. While his argument in the previous work had been congratulatory of the great accomplishments of past geographers, in this later work González Cañaveras shows hostility and impatience towards the same authors. He opens the *Planisferio* with a direct criticism of the Cassini family and their legacy in French geography. While the Cassini's had believed that the world was a compressed ellipsoid, González Cañaveras notes that they incorrectly assumed that the compression would elongate the meridian creating a prolate ellipsoid. Were this the case, the longest axis would occur from pole to pole. However, as González Cañaveras states,

[65] For more on the myth of Fusang, see Joseph Needham, *Science and Civilisation in China*, vol. 4, part 3 (Cambridge: Cambridge University Press, 1971), 540–542. González Cañaveras' location appears to be derivative of Philippe Buache's own 1753 map, see Philippe Buache, "CARTE DES NOUVELLES DÉCOUVERTES entre la partie Orient.le de l'ASIE et l'Occid.le de l'AMERIQUE: Avec des Vues sur la Gr.de Terre reconnue par les Russes en 1741. et sur la Mer de l'Ouest et autres communications de Mers" (Paris: sur le Quay de l'Horloge du Palais, 1753).

this is not the case. In fact, the effects of magnetism and orbital compression elongate the equatorial axis creating an oblate ellipsoid.

> The figure of the Earth is somewhat flattened, or flattened to the Poles, and this does not conform to what was told to us by the Cassini family in their measurements, performed at the beginning of this century. According to these, the Earth is an ellipsoid, that is an oval figure, prolonged at the Poles, so that the major axis goes from one Pole to the other, and the minor is the axis of the Equator. But the opinion of the Moderns is the contrary, as they give the minor axis from one Pole to the other, and assert greater the diameter of the Equator, by about seven leagues.[66]

The observations that González Cañaveras is criticizing dates back to the 1720s, when the Cassinis were among the staunchest supporters of the Cartesian position in a disagreement between Cartesians and Newtonians over the shape of the earth. The 1735 Spanish-French geodetic mission to Peru, which Jorge Juan and Antonio de Ulloa accompanied, was one of two voyages that had confirmed the Newtonian system by mid-century.[67] It is inexplicable, then, that González Cañaveras – over half a century after the matter was settled – felt it necessary to resurrect this argument. Its importance here may be ascribed, however, to the centrality of longitudinal and latitudinal lines in González Cañaveras' map. Were the earth to take a different shape, such as that of a prolate ellipsoid, it would drastically change the argument of the *Planisferio*.

The map accompanying the *Planisferio* employs a cylindrical equal area projection that "produces extensive polar distortions that decrease toward the equitorales

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[66] González Cañaveras, *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos*, v–vi. "*La figura de la Tierra es algo aplanada, ó aplastada hácia los Polos, y ésta no es conforme á la que nos dieron los señores Casiní en sus medidas, ejecutadas en principios de este siglo. Según estas, la Tierra es una elipsoide, esto es de figura oval, prolongada por los Polos, de suerte que el mayor eje va de un Polo á otro, y el menor es el exe del Equador. Pero la opinion de los Modernos es al contrario, pues dan el menor eje de un Polo á otro, y establecen mayor el diámetro del Equador, como unas 7 leguas*."

[67] For more on this effort, see Chapter One, pp. 66-70. For more background, see Mary Terrall, *The Man Who Flattened the Earth: Maupertuis and the Sciences in the Enlightenment* (Chicago: The University of Chicago Press, 2002), 88–99; Neil Safier, *Measuring the New World: Enlightenment Science and South America* (Chicago: University of Chicago Press, 2008), 5–7.

regions, in order to achieve parallel longitudinal lines."[68] Such a projection is noteworthy in the history of cartography, especially in the context of Spanish geography of the Caroline period. While from the sixteenth century through the eighteenth century, geographers sought cartographic projections that conveyed exactness and precision, the projection that González Cañaveras employs does not pursue this same goal.[69] Rather, it purposefully and meaningfully distorts the map image in order to advance a specific representational goal – namely the 'line' as analytic. Given that the globe is a three-dimension spheroid, it had been accepted since Claudius Ptolemy that representing a spheroid on a two-dimension, planar surface would, inherently, carry some form of distortion. By adopting this particular projection González Cañaveras was sacrificing cartographic accuracy in order to pursue greater analytical power. That is, the landmasses depicted on the map are not meant to be read as representations of geographical information. Instead, the whole map must be understood as a tool to analyze data that then creates new information. The map, which was engraved by José Antonio Ximeno y Carrera, appears in twelve sheets that assemble to form a detailed image of the global Spanish empire (see Figure 6.2).[70] This large scale allows the viewer to locate specific cities in the global empire on the map with ease.

González Cañaveras explains the utility of his map in a cartouche at the bottom center of the image, which also refers the reader to the accompanying text for greater

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[68] W. Michael Mathes, *Planisferio ó carta general de la tierra: Madrid 1800* (Madrid: Ediciones José Porrúa Turanzas, 2009), 16. Mathes notes that Johann Heinrich Lambert first employed this projection in 1772. For more on the mechanics of this projection, see John P. Snyder, "The Transverse and Oblique Cylindrical Equal-Area Projection of the Ellipsoid," *Annals of the Association of American Geographers* 75, no. 3 (September 1985): 431–442.

[69] For more on the search for precision in Caroline Spain, see Nara Fuentes Crispín, "Triángulos y anhelos de precisión. Entre la geografía de escritorio y la geografía de campo: discurso y gabinete de Juan Polo y Catalina," *Memoria y Sociedad* 16, no. 32 (January 2012): 87–102.

[70] Four sheets of 40x56cm, four sheets of 36x56cm, two sheets of 40x31cm, and two sheets of 36x31cm for a total image of 1.52x1.43 meters when assembled.

explanation of his specific points.[71] In essence, the critical analytical elements of the planisphere are the columns that frame either side of the image. Aligning with these columns, grids of intersecting orthogonal lines on the image are associated to longitudinal and latitudinal values. González Cañaveras uses this lattice to define a series of zones, which he then uses in the accompanying book to locate general trends that the viewer may observe in each of these specific zones. All of González Cañaveras's distinctions are customary, such as the distinction between the northern and southern hemispheres. González Cañaveras also defines five climatic zones on his map: the Arctic, Equatorial, Antarctic, Tropic of Cancer, and Tropic of Capricorn. On the González Cañaveras map, however, these lines do not simply represent the different climatic zones, but instead are used to define fixed borders and create concrete spaces that become units of analysis. That is, by locating a place on the grid within one of these units of analysis, one may determine important details about local time, or the climatic and meteorological conditions there. Governmental officials in Madrid were meant to engage with the map to

[71] González Cañaveras, "Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos." "*Usos de este Planisferio. Por este Planisferio y su artificio se podrán resolver mas de 60 problemas de Esfera sin necesidad de recurrir al Globo. 1º Por las dos colunas del dicho Planisferio se podrá hallar la Longitud y Latitud de qualquier lugar. 2º Sabidas estas, se podrá hallar el punto de qualqier lugar aunque no esté señalado. 3º Se podrán hallar todos los lugares que tengan la misma Longitud y los que tengan la misma Latitud. 4º Por la coluna de la derecha de el, se podrá hallar la duración del mayor y menor día, en todos los Pueblos de la Tierra. 5º La hora de salir y ponerse el sol en el mayor y meno día del año, en qualqier pueblo. 6º Sabidas estas, conocer su Latitud. 7º Sabida la hora del día o de la noche de un lugar, hallar la que seria en otros. 8º Hallar los Periecos, Antecos, y Antípodas de una lugar. 9º Demostrar como no se pueden dar dos lugares que tengan la misma longitud y latitud de una misma especie. 10º Señalado un lugar qualquiera, hallar todos los que tienen las horas al mismo tiempo que el propuesto o las en que se diferencian los otros. 11º Saber quantas horas tiene un lugar su medio día, antes o después que otro, y la hora que es en todo el Mundo, a una hora dado en un lugar. 12º Saber la diferencia de horas del mayor y menor día del año en un pueblo respeto de otro. 13º Saber en que clima está situado un lugar. 14º Siendo medio día en uno, saber los demás en que es de día, y en los que es de noche, en este momento. De la misma manera por la coluna de la izquierda del Planisferio, se podrá saber qual es la duración del Crepúsculo en qualqier latitud en ee Estio o el Ynvierno con otras curiosidades que se presentarán al hombre estudioso, con solo tender la vista por el expresado Planisferio*."

discover both general trends and specific conditions in all parts of the global Spanish monarchy. Better understanding of the relationship between such temporal, climatic, and

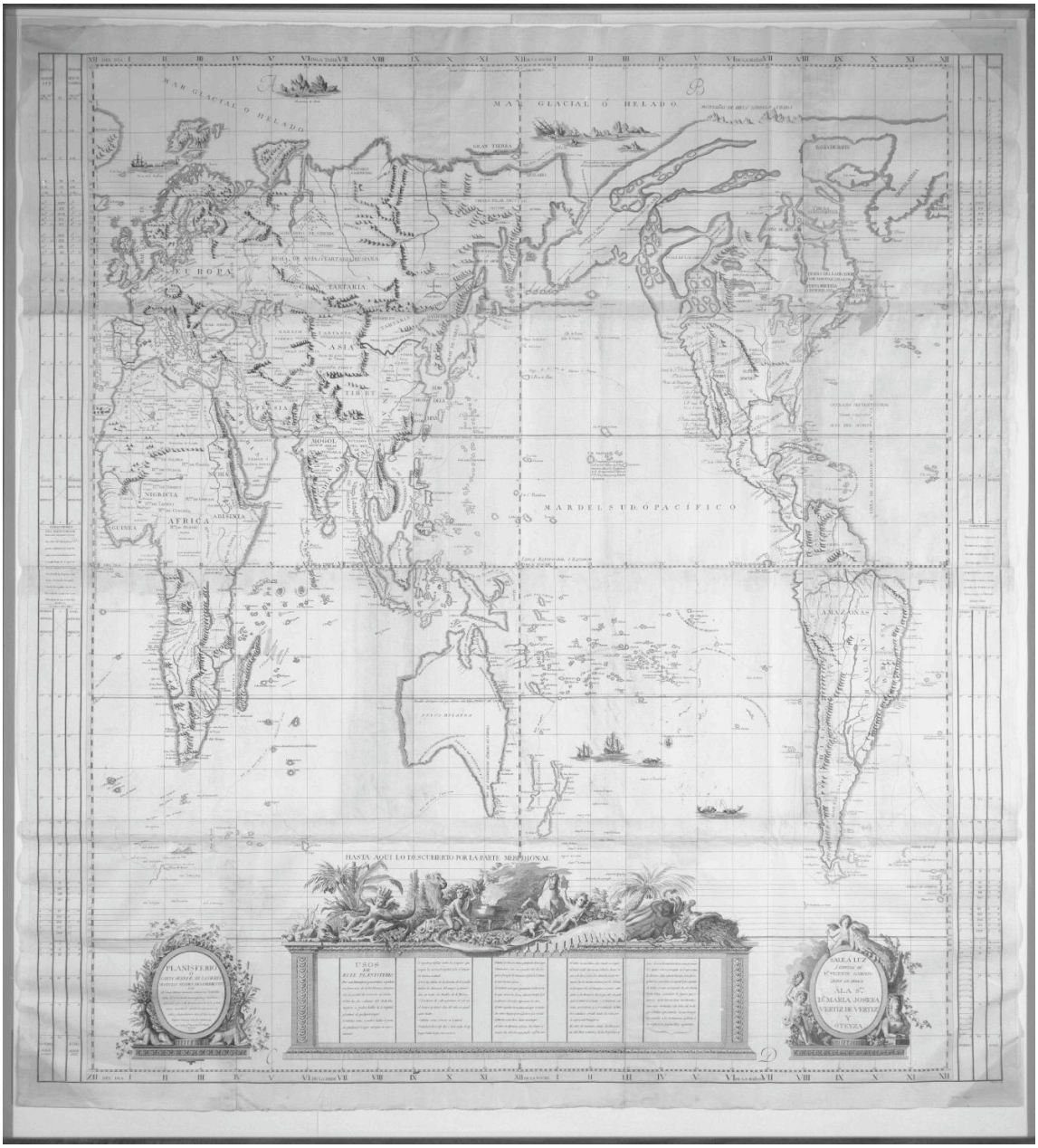

Figure 6.2 Juan Antonio González Cañaveras*, Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos*, (Madrid, 1800)

meteorological trends would, in theory, provide data that would allow for the pragmatic reformation of governance. In representing these trends on a global scale, González Cañaveras wanted the viewer to move away from reading a map by focusing on particular

landmasses and recognize instead general, global trends. With this map, Charles III and his ministers in Madrid could know the specific conditions of all parts of the global monarchy. Indeed, it is a vision of the empire where information was not meant to be *drawn on* the map, but *drawn from* it.

The transformation of the map into a tool as described above was part of a larger shift in scientific visualization occurring at the end of the eighteenth century. Images were changing from representations of known information into new forms that could be used to discover previously unrecognized trends in known data. William Playfair had first developed the use of visualizations in this way in his statistical atlas of 1786, which used statistical graphs to illustrate analyze the English economy.[72] The cross-section diagram of the global Spanish empire that González Cañaveras created is similar to other well-documented innovations in mapping from the early nineteenth century, most notably the work of Alexander von Humboldt.[73] Humboldt's *Tableau physique* (known as the Chimborazo Map) displayed the distribution of vegetation on the face of this volcano, then believed to be the highest peak in the Andes if not on earth.[74] The biodiversity of the

[72] For more on Playfair, see Ian Spence and Howard Wainer, "William Playfair and His Graphical Inventions: An Excerpt from the Introduction to the Republication of His 'Atlas' and 'Statistical Breviary'," *The American Statistician* 59, no. 3 (August 1, 2005): 224–229; "The Story of the First Charts, in Three Charts," *Harvard Business Review* 92, no. 6 (June 2014): 32–33. For more on this history of diagrams, see Thomas Hankins, "Blood, Dirt, and Nomograms: A Particular History of Graphs," *Isis* 90, no. 1 (1999): 50.

[73] On this point, see especially Michael Dettelbach, "Humboltdian Science," in *Cultures of Natural History*, ed by. Nicholas Jardine, James A. Secord, and Emma C. Spary (Cambridge: Cambridge University Press, 1996), 298–300. For more on Humboldt, his legacy, and his *physique du monde*, see Margarita Bowen, *Empiricism and Geographical Thought: from Francis Bacon to Alexander von Humboldt* (New York: Cambridge University Press, 1981), 210–216, 219–222; Jorge Cañizares-Esguerra, "How Derivative Was Humboldt? Microcosmic Narratives in Early Modern Spanish America and the (Other) Origins of Humboldt's Ecological Sensibilties," in *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World* (Stanford, Calif: Stanford University Press, 2006), 112–128.

[74] Fore more on the Chimborazo Map and its visualization of biodiversity, see Karl S. Zimmer, "Mapping Mountains," in *Mapping Latin America*, ed by. Jordana Dym and Karl Offen (Chicago: The University of Chicago Press, 2011), 125–130; Andrea Wulf, *The Invention of Nature: Alexander von Humboldt's New World* (New York: Alfred A. Knopf, 2015), 85-93.

mountain was presented along with measurement of altitude, humidity, atmospheric pressure, and temperature. The cross-sectional view provided by Humboldt made complex information readily available and this allowed viewers to see general trends emerge in the relationship between various measurements. However, while Humbodlt's map of the Chimborazo exposed previously unknown linkages in natural phenomenon, González Cañaveras's map was very derivative and did not expose any new information.

It remains important to note, however, that González Cañaveras's conceptualization of the map as a kind of tool was innovative, even if his map did not, itself, produce any innovative information. One way in which the *Planisferio* presents data is chronological, framing time and space from midnight on the far left through all the hours of the day moving eastward. González Cañaveras calls these lines a "clock" that derives from the sun's motion through the sky.[75] Passing from north to south on the image, González Cañaveras notes the inverse relationship between longitude and the seasonal length of the day for each locale.[76] In order to illustrate the value of the "clock," González Cañaveras explains the information that may be determined by consulting his map in the accompanying text, using the examples of Ireland, Newfoundland, and the Malvinas Islands.[77] While Ireland and Newfoundland share a latitudinal line, their

[75] González Cañaveras, *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos*, 20. "*En la cabeza, en el medio, y al pie del Planisferio se nota el reloj general que resulta por todo la Tierra, causado por la iluminacion del Sol en ella […]*"

[76] Cañaveras is noting that while days are shorter in the northern hemisphere during the winter, locations in the southern hemisphere that share a latitudinal value are experience longer days during their summer season. In Cañaveras's example, Ireland and Newfoundland are both located on the 52º parallel north, while the Falklands (Malvinas Islands) is located on the 52º parallel south. Newfoundland and Ireland experience similar seasonal weather, but the opposite season of the Falklands. However, while Newfound and the Falklands have similar amounts of sunlight at the same time since they are at similar longitudinal values, the time Ireland is a few hours ahead since it is located along a different meridian. None of these relationships were radical or new in 1800, but had been understood since antiquity.

[77] González Cañaveras, "Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos," 33–34. "*En Irlanda , que se halla hacia el Grado 51 de Latitud septentrional y desde el 1 al 15 de Longitud, es el mayor dia del año, de 16 horas y 30 minutos; y cuando tiene el medio-dia , tienen*

difference in longitude means that the midday in Ireland is only nine in the morning in Newfoundland. However, while Newfoundland and the Malvinas share a latitudinal value, they rise in opposite hemispheres and thus experience opposite seasonal weather. While time and season are linked to the motion of the sun, González Cañaveras also argues for the importance of the motion of the zodiac in lengthening or shortening the length of the day in each locale.[78] The columns that frame the *Planisferio* trace the Zodiac, in addition to tracing solar motion as previously described.

The Spanish empire, itself, however was the main object of interest for González Cañaveras, who chose to represent its united imperial identity through the use of color. At the end of the previously detailed cartouche, González Cañaveras notes that:

> The color scarlet indicates the possessions of the Catholic King of Spain [*Rey Católico de las Españas*] and by this one may see the vast expanse of his domains. Four colors represent the division [of the world] into four parts: Europe, Asia, Africa, and America, each with the corresponding islands and capital [cities] denoted with a point of color on them.[79]

The use of color to indicate the vast territorial holdings of the Spanish empire as a single uniform political body serves to underscore the value of this map for the governance of a

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en la Isla de Terránova, en la América septentrional que está en la misma Latitud, pero con diferencia de unos 300 Grados de Longitud, las 9 de la mañana del mismo dia, sin diferencia en Estación pues á un mismo tiempo es el Estío o Invierno, que en Irlanda; lo que no sucede en las Islas Maluinas, en el Occeano meridional, que aunque tienen la misma hora que en Terranova, y también de dia, tienen entonces el Invierno; y lo mismo que se dice de este País, se debe entender de los demás."

[78] Ibid., 34–35. "*El aumento del dia mayor, desde el grado 66 1/3 de Latitud, hasta el 90, es de 31 dias cada mes, en la parte septentrional, y en la meridional de 30 dias, por razón de detenerse mas el Sol en los Signos septeñtrionales Aries, Tauro, Geminis, Cáncer, Leo, y Virgo, que en los meridionales Libra, Scorpio, Sagitario, Capricornio, Aquario, y Pisces. Y asi se de tiene el Sol en los Signos septentrionales, desde el principio de Aries hasta Libra, 186 dias, 14 horas y 50 minutos; y en los meridionales , desde el principio de Libra hasta Aries 178 dias, 14 horas y 59 minutos: los quales completan los 365 dias, 5 horas, y 49 minutos, que gasta el Sol en recorrer todos los Signos del Zodiaco*." González Cañaveras is describing how the earth's tilt affects the length of the seasons in each hemisphere. Summer is both cooler and longer in the northern hemisphere, while winter is longer and colder in the southern hemisphere.

[79] González Cañaveras, *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos*. "*El color de escarlata señala las Posesiones del Rey Católico de las Españas y por el se ve la extensión de sus vastos Dominios. Los quatro colores principales de el representan la división de las 4 partes Europa, Asia, África y América, con sus Yslas correspondientes y las Capitales de todos se notan con un punto de color sobre ellas.*"

global empire. At a time when Caroline reform was directed towards such diverse interests as political economy and agricultural production, the *Planisferio* makes such management centralized to one image. Looking at the map from afar one may easily discern which locations are Spanish by the coloring schema. The juxtaposition of the reddened Spanish territories with the colorless landmasses reveals the extensive, global character of the Spanish monarchy. The use of color here for political purposes is also noteworthy predating the better-known use of red to represent the British Empire in the nineteenth century.[80]

Figure 6.3 Detail from the *Planisferio* depicting the Artic Sea

While the *Planisferio* incorporates new technologies and new ways of ordering the physical world, these aspects of the chart are juxtaposed against González Cañaveras's use of hypothetical and fantastical geography. This influence is most apparent in the Arctic region, where nautical routes and mythical civilizations are shown.

[80] See, e.g., John Charles Ready Colomb, "Imperial Federation, map of the world showing the extent of the British Empire in 1886" (Maclure & Co., 1886), G5730 1886 .C6, Norman B. Leventhal Map Center, Boston Public Library. The use of color in cartography has a long history, but it was not until changes in printing – specifically lithographic technologies – in the nineteenth century that mass production of color detail became feasible. For more on this narrative, see Ulla Ehrensvärd, "Color in Cartography: A Historical Survey," in *Art and Cartography: Six Historical Essays*, ed by. David Woodward (Chicago: University of Chicago Press, 1987), 123–146. Color had been applied in analytical fashion before the nineteenth century, but its use for representing empires on a global scale does not figure into this earlier period, see: Mary Sponberg Pedley, *The Commerce of Cartography: Making and Marketing Maps in Eighteenth-Century France and England* (Chicago: University of Chicago Press, 2005), 67–70.

The presence of these elements, such as the mythical *Fugang*, is curious alongside depictions of whalers in the burgeoning northern fishing grounds that suggest González Cañaveras's awareness of current affairs in the region. In fact, the travel accounts of the numerous commercial and imperial expeditions to the north worked to disprove the theory of a Northwest Passage before the turn of the nineteenth century. González Cañaveras's creation of routes in the Arctic and Antarctic zones, as well as his depiction of "ice mountains," contrast with other more empirical elements of the *Planisferio*.[81]

The success or failure of González Cañaveras bold map is hard to ascertain. Benito Cano printed both the map and the treatise, a sign that they were lavish products that bore royal approval. Still, the sheer size of the *Planisferio* suggests that only individuals in the higher echelons of the government could have afforded to purchase and study the map. While González Cañaveras is best remembered for his curricular reforms, this later work shows another side to his career. Throughout his life, González Cañaveras was very much both ahead of and behind the times. Although he was an early advocate for the introduction of modern European philosophy to Spain, in his later life González Cañaveras faced harsh criticism from younger government officials who had benefited from this curricular reform.[82] Still, the Cañaveras world map found its way into the archives of the Royal Palace, the ministry of the state, and other state organs.[83]

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[81] González Cañaveras, *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos*. Adjacent to Russian exploration of the region, these curious images are labeled as "montañas de hielo sobre la tierra."

[82] See, e.g., José e Vargas Ponce, Real Academia de Historia (RAH), RAH-9-4230-10, doc. 1, fol. 1r-2r. As quoted in Fernando Durán López, *José Vargas Ponce, 1760-1821: ensayo de una bibliografía y crítica de sus obras* (Cádiz: Servicio Publicaciones, Universidad de Cádiz, 1997), 183.

[83] González Cañaveras, *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos* [map]. See: AHN Estado Proc. Leg. 3197 Sig. 845; BNE MR/21; BPR MAP/85 (29-40).

Conclusion

What conclusions may be drawn from a comparison of these two maps, one allegorical and the other analytical. It should be immediately noted that such representations of the global Spanish empire in a single image are exceptionally rare. In fact, while world maps certainly existed in Spain, they did not contain the sort of political imagery found in both Memije and González Cañaveras. The nearest comparison for eighteenth century Spanish cartography would be Tómas López's *Mappa Mundi*, but this image never explicitly attempts to represent the Spanish monarchy on a global scale.[84] Although the map appears in López's *Atlas geográfico de España*, it depicts the globe in an equitable and non-political manner utilizing a double-hemisphere stereographic projection. In contrast, Memije's image draws on an earlier tradition of allegorical mapping to represent political union, while González Cañaveras previews the use of color to symbolize the global span of empire.

It bears repeating that neither vision of Spain presented in this chapter was part of the elaborate, state-sponsored geographic reform project. Two institutions with different goals and methods for achieving geographic reform directed such state geography. The military, most notably the navy, and the Royal Academy of History directed projects to complete atlases of Spain. Within the navy, Vicente Tofiño and his pupils at the naval academy in Cádiz directed this effort and its many observational voyages. Tomás López and Juan de la Cruz Cano, each under the title of Royal Geographer, created comprehensive visions of the Spanish peninsula and colonies (excluding the Philippines),

[84] Tomás López, "Mappa Mundi: o descripción de todo el mundo, y en particular del Globo Terrestre sujeto a las observaciones astronómicas" (Madrid: Imprenta Real, 1771). See: Real Academia de Historia (RAH), GM/857; RAH GM:Mr/2. Notable about this image – which exists in three versions: 1771, 1792, and 1792 – is López's inclusion of four astronomic systems at the bottom of the image: namely, the Copernican, Ptolemaic, Tychonic, as well as Capella's composite model.

respectively from their seats in Madrid. Excluding the López map mentioned before, the paucity of governmental maps contributing to this genre ought to be noted. It is striking that the cartographic conceptualization of the Spanish monarchy as a united, singular imperial body was not the product of state-apparatus described in Chapter Four. Instead, Memije, a *creole*, presented himself as a loyal Spanish subject and used an allegorical representation of the unified global Spanish monarchy to call for increased monarchical investment in the Philippines. Meanwhile, while Caroline ministers attempted to incorporate the science of geography into state reform, it was González Cañaveras – who was not a part of their discussions or a member of their academies – who attempted to devise an effective tool to improve geographical governance. Historians of the Bourbon Reforms have been critical of peninsular treatment of the colonies, often blaming reformers for alienating creoles.[85] One of the two maps discussed in this chapter suggests a more productive line of inquiry: why would Vicente de Memije have felt that depicting a cohesive, singular imperial body would further his argument? Memije mobilized the image of a *mundo Hispánico*, wrapped in allegory, in order to gain the attention of an absent monarch. Memije felt that Spain had abandoned the Philippines and looked forward to the promise of a truly global Spanish empire, while using the Book of Daniel to caution Madrid of the danger that would befall Spain if the Philippines continued in neglect. We may similarly question why Juan Antonio González Cañaveras would have felt that using color to depict the Spanish empire as a uniform political body would benefit his message about the potential of scientific visualizations to serve as analytical tools. González Cañaveras believed in the practicality of his analytical map. Realizing that such an image was particularly suited to the reform of global governance –

[85] See, e.g., the D.A. Brading comments cited earlier in footnote 58.

ostensibly, the objective of reform in Bourbon Spain – González Cañaveras directed his map to those governmental ministers charged with overseeing state reform. Thus, while Memije called for global governance, González Cañaveras offered a tool that might assist in that obligation.

We can conclude from these two maps that Spaniards across the span of the empire – literally, from Manila to Madrid – regarded a cohesive, total image of their monarchy as important. While Vicente Memije mobilized imagery to solicit greater monarchial investment, Juan Antonio González Cañaveras used similar subject matter to suggest the value of new science to the administration of empire. Geographic reform of the monarchy was not simply the concern of a small group of privileged men in Madrid, but also concerned those outside the centers of power.

Conclusion
The Science of Reform and the Importance of Spanish Geography

Following defeat in the War of the Spanish Succession – and the accompanying concessions of Atlantic and European territories – Spain was in desperate need of comprehensive reform, an important part of which would involve including accurate geographic renderings of the realm. The Spanish Bourbon Empire underwent comprehensive state reforms throughout the long eighteenth century guided by ideals of state centralization, the rationalization of governance, and the "modernization" of state policy. Each of these aims was pursued using data and methodologies dependent on the science of geography. The resulting geographic reform described in this dissertation included works of demography, fortification, cadastral surveying, navigational cartography, and field sketches of a natural historical or botanical nature; it also extended to both the peninsula and the colonies, and was intended to function as a way of uniting both under the banner of a global Spanish monarchy.

This dissertation has examined the interaction between state reform and the science of geography across time and space in the global Spanish monarchy under the House of Bourbon. It first examined the negotiations of the Treaty of Utrecht (1715) and Spain's losses following the War of the Spanish Succession (1700-1715). Philip V of Spain and his new cabinet of ministers had attempted to resurrect Spanish domestic and colonial policies collapsing under administrative inefficiencies, commercial decline, and intellectual stagnation. Concurrently, the rising importance of cartography as part of international diplomacy necessitated a rapid response from Spanish ministers, leading to investment in military science and navigation. As cartographic sovereignty, that is, the

recognition of observationally based mapmaking as an evidentiary claim of territorial control, advanced in Europe, it inspired the development of Spanish geographic science. Mid-century reforms enacted by Zenón de Somodevilla, marqués de la Ensenada (1702-1781) expanded these earlier efforts to include the development of statistical governance, sending Spaniards abroad for technical education, and a proactive attempt to delineate a permanent boundary in the Amazon between the realms of the two Iberian nations. Governmental investment in geographic reform reached its highest levels during the Caroline period, the reigns of Charles III and Charles IV of Spain between 1759 and 1808. It was during this period that two important cartographic centers competed for governmental attention for their representations the unified Spanish-Atlantic monarchy in state sponsored atlas projects, at the Royal Academy of History and naval academy in Cádiz. Meanwhile, Spaniards and creoles across the empire began to forward their own cartographic visions of a unified Spanish world to Madrid to strengthen their petitions to the centralized state authority for monarchical investment.

Following the abdication of Ferdinand VII (r. 1808; 1813-1829) and occupation of the Iberian Peninsula by Napoleonic forces, the Spanish empire was dissolving under foreign occupation and colonial rebellion.[1] Instability on the Iberian Peninsula created similar chaos in Spanish America, where a series of *juntas* were established to administrate the colonies. Beginning in 1810, Spanish American civic leaders wrestled with the future of the Spanish colonies and soon new republics began to replace the

[1] The Peninsular War (1807-1814) was fought between Napoleonic forces of the First French Empire and the collected militaries of Portugal, Spain, and Great Britain. Charles IV had abdicated early in 1808 in favor of his son, Ferdinand VII, who then abdicated the throne, under some duress, for Napoleon's chosen ruler, his brother Joseph Bonaparte.

former colonial governments.[2] Meanwhile, Dom João, Prince Regent of Portugal, and the royal family fled conflict in Europe and began to govern the Portuguese Empire from Brazil.[3] Throughout the first few decades of the nineteenth century, the United States of America sought unfettered territorial expansion into former Spanish colonies. Thus, across the Ibero-Atlantic nexus, conflict and political instability ruptured the image of a unified global Spanish Monarchy geographers had tried to construct. While the occupation of the Iberian Peninsula by Napoleonic forces in 1808 dethroned the Bourbon monarchy, the geographic reforms described in this dissertation continued to influence Atlantic actors after the dissolution of the Spanish-Atlantic monarchy into the early nineteenth century. The Napoleonic Wars had devastated the ranks of military geographers, but some individuals left the occupied peninsula and joined geographic communities of Britain and the United States. In Spanish America, state geography was mobilized as part of independence movements and by the government of the United States of America to shape its own image as a republic.

Although there existed a number of competing geographic epistemologies within the eighteenth century Spanish Empire, the reform of cartographic centers in peninsular Spain highlights two traditions as predominant. It was the difference between these two – the community of "scientific officials" centered at the naval academy in Cádiz and the "studio cartography" of the Royal Academy of History – that gave geographic reform in

[2] For a recent assessment of these new, independent republics, see James E. Sanders, *The Vanguard of the Atlantic World: Creating Modernity, Nation, and Democracy in Nineteenth-Century Latin America* (Durham: Duke University Press, 2014).

[3] For more on the Portuguese royal court in Brazil, see Gabriel B. Paquette, *Imperial Portugal in the Age of Atlantic Revolutions: the Luso-Brazilian World, c. 1770-1850* (Cambridge: Cambridge University Press, 2013), 84-163.

Spain its unique character.[4] While European observers praised the former institution, the shortcomings of geographic practices of the latter institution became gravely apparent during the Napoleonic Wars.

As geographic reform developed in the Spanish world during the eighteenth century, the flow of geographic thought between the peninsula and the colonies was neither linear nor unidirectional, but, rather, incredibly fluid. This dissertation has attempted to use maps and mapmaking as a point of entry into questions of governance, political economy, and national identity. It may be useful to frame the argument as a series of dialectics: mathematical versus studio cartography, temporality versus permanence, centralization versus a shift to the periphery, history versus reform, and manuscript versus print cartography. A central argument of the dissertation has been that there existed a uniquely Spanish geographic vision that informed – and was informed by – the reform movement definable by three essential characteristics: pragmatic methodology, observational redundancy, and a focus on peripheral regions. It is coexistence of these oppositional forces, these dialectics, which underlies the uniquely Spanish geographic vision. As state officials labored to guide reforms aimed at strengthening the global monarchy and reinvigorating Spain as a centralized state, they struggled to reconcile a trans-European embrace of science and technology with their desire to recreate imperial successes from two centuries earlier.

[4] These labels are borrowed from: María Dolores González-Ripoll Navarro, "La Formación Académica y Práctica de Los Marinos del Siglo XVIII: Cosme de Churruca (1761-1805), un Oficial Científico," in *De la ciencia ilustrada a la ciencia romántica: actas de los II jornadas sobre "España y las Expediciones en América y Filipinas,"* ed. Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández (Madrid: Ed. Doce Calles, 1995), 312–323; Antonio López Gómez, *Cartografía del siglo XVIII: Tomás López en la Real Academia de la Historia* (Madrid: Real Academia de la Historia, Departamento de Cartografía y Artes Gráficas, 2006), 22–28.

The pragmatism characteristic of this geographic reform was present since the reign of Philip V, when Bourbon interests sought effective tools of governance to help prevent further loss and curtail commercial and military stagnation. While Ensenadean reform added an idealistic vision of the utopian scientific state to geographic reform, Spanish state geography throughout the eighteenth century remained practical and not theoretical. Spanish innovation in the science of geography during the eighteenth century took the form of improvements in navigation, calculation of lunar and solar position for the purpose of ascertaining latitude and longitude with precision, and other practical pursuits. The mathematical cartography tradition associated with naval scientists in Spain clearly demonstrates the emphasis on observational redundancy, sending successive waves of voyages to measure the colonial realm and peninsular coastlines. Finally, this dissertation has shown the increased concentration on imperial peripheries by Madrid during the eighteenth century. Places such as the Straits of Magellan, Nootka, the Pyrenees, and the Philippines were the subject of imperial scrutiny because of their vulnerability to imperial competition and mercantile scrutiny for resources to revive the colonial export economy.

The Spanish unifying geographic vision described in this study is the inverse of similar methods adopted by eighteenth century British and French geographers. While British and French geographers pursued increased precision at the expense of cultural sensitivity, Spanish geographers developed practices that adopted methods to increase precision while remaining connected to Spanish history and culture. The British triangulation survey of India, as Matthew Edney has shown, attempted to create a geography of *exclusion* and possession, distinguishing the rational from the irrational, the

ordered from the chaotic, the British from the Indian.[5] In contrast, the Spanish geographic vision described here created a geography of *inclusion*. Spain simultaneously attempted to articulate a scientifically rigorous definition of their territories that would signal sovereignty to their European rivals and an argument for similarity that would convince Spaniards all across the Spanish world that they belonged to the same group as those who sat in Madrid. Spain was not only centralizing its state, but also, it hoped, centralizing the hearts of its subjects.

Nowhere in Spanish geography was the precarious relationship between scientific progress and historical memory more apparent than in the many ways the Treaty of Tordesillas was invoked. Drafted at a time of technical imprecision, Tordesillas was, perhaps, more important in the eighteenth century than in the fifteenth or sixteenth centuries. Its impact on the Atlantic and Pacific worlds, its renegotiation (beginning in 1750 with the Treaty of Madrid), and its invocation as a binding legal principle in the 1790s, some three centuries after it was signed, to settle the Nootka Crisis, all these incidents show the growing not diminishing impact of Tordesillas on Spanish geography.

The previously described dialectical tension of geographic reform between the metropolis and the imperial periphery may have also been an attempt to insert the neglected imperial periphery into the history of the empire while using precise mathematical language to articulate contemporary sovereignty to European competitors. In Nootka, for example, Spaniards attempted to encapsulate centuries of Spanish colonialism by invoking Tordesillas and constructing settlements, while building astronomical observatories to signal present occupation to Great Britain.

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[5] Matthew H. Edney, *Mapping an Empire: the Geographical Construction of British India, 1765-1843* (Chicago: University of Chicago Press, 1997), 32.

The death of Carlos II of Spain on 1 November 1700 ended Habsburg rule in Spain. The Spanish House of Bourbon that replaced it worked to reform every aspect of the global Spanish monarchy in hopes of restoring the empire to its prior glory. It was a century of brisk changes and profound restructuring in the Spanish world; underlying all of these reforms was the science of geography.

Dramatis personae

Dionisio de Alcalá-Galiano (1760 – 1805) was a Spanish naval officer and cartographer, linked to the scientific enclave in Cádiz, the Magellan Survey, and the Malaspina Expedition. He contributed to the *Atlas marítimo de España* and mapped much of the Atlantic and Pacific coastlines of the Americas. Alcalá-Galiano led an expedition to map the Strait of Juan de Fuca and the Strait of Georgia, near Nootka, and made one of the first European circumnavigations of Vancouver Island. He died during the Battle of Trafalgar.

Felipe Bauzá y Cañas (1764 – 1834) was a Spanish geographer, astronomer, and naval officer. Among the naval officers who contributed to Tofiño's *Atlas marítimo de España*, Bauzá maintained personal correspondences with José Joaquín de Ferrer y Cafranga, Cosme de Churruca, and Alexander von Humboldt. He was employed as a cartographer during the Malaspina Expedition – an island near New Zealand was named for him – and created a map of provincial divisions for Napoleon's invading army during the Peninsular Wars. He was named directory of the Depósito Hidrográfico in 1815.

Alejandro Belmonte (unknown, late 18th c) Spanish naval officer, cartographer, and explorer associated with Cádiz and with the Magellan Survey.

José de Campillo y Cossío (1693 – 1743) a transitional figure within the Bourbon Reforms, Campillo links the early and middle phases of reform. Beginning in 1717, Campillo worked as a naval administrator under the direction of José Patiño, naval secretary and, later, secretary of state. From 1741 until his death, Campillo succeeded Patiño as prime minister of Spain. Campillo was also a major economic thinker, his major work, *Nuevo sistema de gobierno económico para la América*, was published posthumously in 1789.

Pedro Rodríguez, conde de Campomanes (1723 – 1802) Campomanes was an influential minister and thinker of the Caroline period. He served as president of the Council of Castile during the reign of Charles III, but left office under Charles IV. Campomanes was also an influential writer, writing primarily concerning the promotion of industry and artisanal knowledge in Spain. His primary works were: *Discurso sobre el fomento de la industria popular* (1774), and *Discurso sobre la education popular de los artesanos y su fomento* (1775).

Ciriaco de Cevallos (1763 – 1816) Spanish naval officer, cartographer, and explorer associated with Cádiz, the Magellan Survey, and the Malaspina Expedition.

Charles III, King of Spain (20 January 1716 – 14 December 1788; r. 1759-1788) Charles ascended to the throne after the death of his brother, Ferdinand VI. He had previously reigned in Naples as King of the Two Sicilies. Many characteristics of the reign of Charles III are definitive Bourbon Reforms, such as economic and political centralization of the empire, anti-clericalism and the expulsion of the Society of Jesus,

and the promotion of science and technology within Spain and its colonies. His reforms proved fragile and reform stalled after his death during the reign of his son, Charles IV.

Charles IV, King of Spain (11 November 1748 – 20 January 1819; r. 1788-1808) The second son of Charles III, Charles IV was born in Naples when Charles III was still King of the Two Sicilies. His older brother, Don Felipe, was born mentally handicapped and with serious medical conditions, leading to Charles' declaration as Prince of Asturias, heir to the Spanish throne. Following his father's death, Charles IV ascended to the throne. Outwardly he kept up the appearance of an absolutist monarch, but he preferred hunting and left the matters of directing government to his wife, Maria Luisa, and his prime minister, Manuel de Godoy. Maria Luisa soon succeeded in ousting all remnants of Charles III's government. This, combined with Godoy's cagey leadership, soon dissolved all the progress of the early Caroline period. Charles IV abdicated in favor of his son, Ferdinand VII.

Cosme Damián de Churruca y Elorza (1761 – 1805) was a Spanish naval officer, cartographer, and astronomer from the Basque region. He died a particularly heroic and gruesome death in the Battle of Trafalgar. He was a member of the scientific enclave in Cádiz, where he contributed to Tofiño's atlas project and the Magellan Survey. He later led his own expedition to chart the Caribbean.

Antonio de Córdoba y Lasso de la Vega (1740 – 1811) was a Spanish naval officer and natural philospher. Córdoba began his service in the Mediterraneanm where he fought Barbary pirates. Later, he served in Havana during the British attack and he was taken prisoner. During his captivity in London, Córdoba maintained his scientific and research activity. Códoba led both the 1785 and 1788 voyages of the Magellan Survey. Following these efforts he was promoted to the admiralty, but soon fell ill and died.

Juan de la Cruz Cano y Olmedilla (1734 – 1790) was a leading Spanish geographer of the of the eighteenth century. Along with Tomás López, Cruz Cano was sent to Paris to study cartography in 1752 by the marqués de la Ensenada. Upon his return, Cruz Cano gained the title of Real geógrafo. A practitioner of the "cabinet geography" method, Cruz Cano is remembered for his 1775 *Mapa geográfico de América Meridional*.

Zenón de Somodevilla y Bengoechea, **marqués de la Ensenada** (1702 – 1781) a prominent Spanish statesman, Ensenada served under three Bourbon monarchs (Philip V, Ferdinand VI, and Charles III). A pioneering figure in geographic reform, Ensenada directed efforts to conduct a peninsular survey, sent promising young Spaniards to Paris to be educated in cartography, and helped to centralize the Spanish state. His pro-French influence under Ferdinand VI was balanced by the pro-British leanings of José de Carvajal. He served as secretary of the Treasury, of War, of the Navy, and of the Indies.

Benito Jerónimo Feijóo (1676 – 1764) was a motivating intellectual force in Bourbon Reform. In his written works, Feijóo championed empiricism as a means of revitalizing society and spurring cultural development. His most well-known writings, *Teatro crítico universal* (1726–1739) and *Cartas eruditas y curiosas* (1742-1760), were serial

publications. Each is a collection of essays, covering topics ranging from natural history, medicine, and technology to pedagogy, philology, history, and religion.

Ferdinand VI, King of Spain (23 September 1713 – 10 August 1759; r. 1746-1759) Ferdinand ruled Spain under the guidance of two influential ministers: Zenón de Somodevilla, marqués de la Ensenada, and José de Carvajal y Lancaster. While the former was an avowed Francophile, the latter favored stronger diplomatic relations with Great Britain. As a result, under Ferdinand Spain carefully balanced its relations with these two powers. Ferdinand signed the Treaty of Madrid in 1750, settling boundary disputes with Portugal in the Americas and protecting Spanish ports from foreing, chiefly British, smuggling.

José Moñino y Redondo, conde de Floridablanca (1728 – 1808)
Floridablanca was a guiding figure of reform during the Caroline period. Chief minister in the court of Charles III, Floridablanca continued in the post under Charles IV before being dismissed. Among his most notable achievements included free trade in the Americas, nationalized banking, and educational reform. Madrid was also "rebuilt" during Floridablanca's tenure, constructing a modern capital around the older city structure.

José de Gálvez (1720 – 1787) influential minister during the reign of Charles III. Gálvez, who began his career as a colonial official in New Spain, eventually rose to attain the office of Minister of the Indies. Among his most notable achievements in this office were the declaration of free trade in 1778, creation of the Real Compañia de Filipinas in 1785, and the introduction of an intendancy system to the Americas. Gálvez reformed existing political structures and created new ones, including the Viceroyalty of Rio de la Plata (1776) and the Captaincy of Venezuela (1777).

Juan Antonio González Cañaveras (unknown,18th c) was an educational reformer and geographer. In 1800, he published a geographical treatise *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos* which was accompanied by a large global map.

Gaspar Melchor de Jovellanos (5 January 1744 – 27 November 1811) was an influential Spanish jurist, writer, and economic theorist. His major work, *Informe en el expediente de ley agraria*, published in 1795, was influenced by the writings of Adam Smith. Originally outside of the government, Jovellanos became Minister of Grace and Justice ("Prince of Peace") during the reign of Charles IV. His opposition to Manuel de Godoy led to his ouster. During the Peninsular Wars (1803-1815), Jovellanos was a member of the Supreme Central Junta.

Tomás López de Vargas Machuca (1730 – 1802) was a leading Spanish geographer of the of the eighteenth century. Along with Juan de la Cruz Cano, López was sent to Paris to study cartography in 1752 by the marqués de la Ensenada. Upon his return, López gained the title of Real geógrafo. A practitioner of the "cabinet geography" method, López was a prolific publisher of maps. López is associated with the Royal Academy of

History and its *Diccionario Geográfico-Histórico de España*. His sons posthumously published his *Atlas de España*, containing 102 maps prepared by López.

Alejandro Malaspina (5 November 1754 – 9 April 1810) an Italian nobleman, Malaspina served Spain as a naval officer and explorer. A member of the scientific circle at Cádiz, he work with Tofiño and studied alongside many other prominent geographers of the era. After leading a circumnavigation from 1786 to 1788, Malaspina led an ambitious scientific expedition from 1789 to 1794. The Malaspina Expedition explored and mapped the Spanish Pacific, focusing on the American coast from Cape Horn to the Gulf of Alaska. His voyage, modeled after the heroic styles of James Cook and Louis Antoine de Bougainville, was both a high and low point for Spanish science in the eighteenth century. His politic sympathies (arguing for the independence of the American colonies) eventually had him exiled to Italy, where he died.

José de Mazarredo Salazar Muñatones y Gortázar (1745 – 1812) Basque Spanish naval officer, cartographer, astronomer, ambassador, and educator associated with the scientific enclave in Cádiz. Renowned as a naval tactician, Mazarredo also composed a new system of signals that were adopted by the Spanish-Franco alliance in the late eighteenth century.

Vicente de Memije (unknown,18th c) creole military office studying at the Royal and Pontifical University of the Society of Jesus in Manila. Accompanying his 1761 thesis were two maps – the *Aspecto geográfico del mundo Hispánico* and *Aspecto symbólico del mundo Hispánico* – in which Memije reoriented normative perceptions of the Spanish empire and the Philippines' place within it.

Philip V, King of Spain (19 December 1683 – 9 July 1746; r. 1700-1724, 1724-1746) Philip originated the House of Bourbon in Spain. His ascendancy to the throne led to the War of the Spanish Succession (1700-1715). Philip was the grandson of Louis XIV, King of France, who personally exercised a great deal of influence over Philip's early reign, in addition to installing the majority of Philip's ministers. Cardinal Alberoni and José Patiño were influential advisors later in his reign. His Nueva Planta decrees in 1707 centralized Spain, expanding the Castilian system of governance to all the historical kingdoms excluding Navarre and the Basque region.

Vicente Tofiño de San Miguel y Vanderiales (1732 – 1795) a rear admiral in the Spanish navy and director of the curricular reform at the Academy of Naval Cadets, Cádiz. Renowned as an astronomer and mathematician, Tofiño had been trained in the Spanish Army before being asked to serve as a mathematics instructor at the academy in Cádiz by Jorge Juan. Between 1783-1788, Tofiño charted the ports and coasts of Spain as well as the shore of North Africa. In addition to his contributions in scientific education, Tofiño directed the Royal Observatory in Cádiz. He eventually was elected as correspondent of the Spanish Academy of History and of the French and Portuguese Academies of Sciences.

Antonio Valdés y Fernández Bazán (1744 – 1816) influential officer of the Spanish Royal Navy. He was a leading reformer of the Spanish Navy, establishing new centers of education and improving the scientific training of naval officers. In 1783, Valdés was name Naval Minister. Valdés was central to commissioning Tofiño to conduct a hydrographic survey of the peninsula, and in motivating the Malaspina Expedition. Lastly, Valdés created the naval banner that Charles III eventually chose to adopt as the Spanish national flag.

Abbreviations

AGI	Archivo General de Indias
AGM-AB	Archivo General de la Marina, Álvaro de Bazán
AGMM	Archivo General Militar, Madrid
AGS	Archivo General de Simancas
AHN	Archivo Historico Nacional
AHU	Arquivo Histórico Ultramarino, Lisbon
AMN	Archivo Museo Naval
BNE	Biblioteca Nacional de España
BPR	Biblioteca de Palacio Real
CGE	Centro Geográfico de Ejército
RAH	Real Academia de Historia
TT	Arquivo Nacional da Torre do Tombo, Lisbon

Bibliography

Abarca de Bolea, Pedro Pablo. *Dictamen reservado que el Conde de Aranda dió al Rey sobre la independencia de las colonias inglesas: despues de haver firmado el tratado de paz ajustado en Paris en el año de 1783*, 1783.

Acuña, Cristóbal de. *Nuevo descvbrimiento del gran rio de las Amazonas por el padre Cristóbal de Acuña ... al qual fué, y se hizo por orden de Su Magestad, el año de 1639*. Madrid: Imprenta del Reyno, 1641.

Adelman, Jeremy. "An Age of Imperial Revolutions." *American Historical Review* 113, no. 2 (2008): 319–340.

———. *Republic of Capital: Buenos Aires and the Legal Transformation of the Atlantic world*. Stanford, Calif: Stanford University Press, 1999.

———. *Sovereignty and Revolution in the Iberian Atlantic*. Princeton: Princeton University Press, 2006.

Ainsworth, Robert. *An abridgment of Ainsworth's dictionary, English and Latin, designed for the use of schools. By Thomas Morrell, D.D. Carefully cor. and improved from the last London quarto edition by John Carey, LL.* Philadelphia, U. Hunt; New-York, J. & J. Harper; [etc., etc.], 1837.

Akerman, James, and David Buissert, eds. *Monarchs, Ministers and Maps: The Emergence of Cartography as a Tool of Government in Early Modern Europe*. Chicago: University of Chicago Press, 1992.

Akerman, James. "Introduction." In *The Imperial Map: Cartography and the Mastery of Empire*, edited by James Akerman, 1–9. Chicago: University of Chicago Press, 2009.

Akerman, James, ed. *The Imperial Map: Cartography and the Mastery of Empire*. Chicago: University of Chicago Press, 2009.

Albareda i Salvadó, Joaquím. "Felipe y la negociación de los Tratados de Utrecht: bajo los dictados del 'mejor abuelo del mundo'." *Cuadernos de Historia Moderna* (October 29, 2013): 31–60.

Alvear y Ponce de León, Diego de. "Diario de la segunda Partida Demarcadora de Límites en la América Meridional ... 1783-1791." *Anales de la Biblioteca Nacional de Buenos Aires* Buenos Aires, vol. 3, 1902; vol. 4, 1904, vol. 6, 1905; vol. 9, 1908, vol. 10, 1910.

Alvear y Ward, Sabina de. *Historia de Diego de Alvear y Ponce de Leon, brigadier de la Armada: los servicios que prestara, los meritos que adquiriera y las obras que escribio, todo suficientemente documentado*. Madrid: Imprenta de Don Luis Aguado, 1891.

Anderson, Benedict. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. Rev. ed. New York: Verso, 2006.

Andrewes, William J. H, ed. *The Quest for Longitude: The Proceedings of the Longitude Symposium, Harvard University, Cambridge, Massachusetts, November 4-6, 1993*. Cambridge, Mass: Collection of Historical Scientific Instruments, Harvard University, 1996.

Andújar Castillo, Francisco. "El interrogatorio y el mapa de Almería de Tomás López (siglo XVIII). Una lectura histórica." *Nimbus: revista de climatología, meteorología y paisaje*, no. 29-30 (2012): 47–60.

D' Anville, Jean Baptiste. *Considérations généerales sur l'étude et les connoissances que demande la composition des ouvrages de géographie*. Paris: Lambert, 1777.
Appleby, John C., and Mandy Banton, eds. *Calendar of State Papers, Colonial Series, America and West Indies*. 43 vols. London: Routledge; Public Record Office, 2000.
Arango, Joaquín. "Origen e historia de los censos en España." *Revista del Centro de Estudios Urbanísticos, Municipales y Territoriales*, no. 23 (1980): 17–20.
Arboleda, Luis Carlos, and Diana Soto Arango. "The Theories of Copernicus and Newton in the Viceroyship of Nueva Granda and the Audencia de Caracas during the 18th Century." In *Universities and Science in the Early Modern Period*, edited by Mordechai Feingold and Víctor Navarro Brotons, 289–309. Dordrecht: Springer, 2006.
Armitage, Geoff, and Ashley Baynton-Williams. *The World at Their Fingertips: eighteenth-century British two-sheet double-hemisphere world maps*. Vaduz, Principality of Liechtenstein; London: Sylvia Ioannou Foundation; The British Library, 2012.
Avilés Fernández, Miguel, ed. *Sinapia: Una utopía española del Siglo de las Luces*. Biblioteca de visionarios, heterodoxos y marginados 11. Madrid: Editora Nacional, 1976.
Babelon, Jean-Pierre. "Louis Le Vau au Collège Mazarin - Rome à Paris?" In *Communication faite à la séance du 25 avril 2001*, 1–17. Paris: Palais de l'Institut, 2001.
Bacon, Francis. *New Atlantis and The Great Instauration*. Edited by Jerry Weinberger. Rev. ed. Arlington Heights Ill.: H. Davidson, 1989.
Baecque, Antoine de. *The Body Politic: Corporeal Metaphor in Revolutionary France, 1770-1800*. Stanford University Press, 1997.
Banks, Kenneth. *Chasing Empire Across the Sea: communications and the state in the French Atlantic, 1713-1763*. Montreal: McGill-Queen's University Press, 2002.
Barreiro, Agustín J. *El Museo Nacional de Ciencias Naturales, 1771-1935*. Edited by Pedro M Sánchez Moreno. Aranjuez: Doce Calles, 1992.
Bas Martín, Nicolás. "Juan Bautista Muñoz (1745- 1799): un ilustrado valenciano, autor de la 'Historia del nuevo mundo' y fundador del Archivo General de Indias." *Estudis: Revista de historia moderna*, no. 26 (2000): 245–262.
———. "Una aproximación a la biblioteca del ilustrado valenciano Juan Bautista Muñoz (1745-1799)." *Saitabi* 48 (1998): 113–147.
Beaver, Adam G. "A Holy Land for the Catholic Monarchy: Palestine in the making of modern Spain, 1469-1598". Ph.D. Dissertation, Cambridge, Massachusetts: Harvard University, 2008.
Belando, Nicolás de Jesús. *Historia civil de España y sucessos de la guerra, y tratados de paz*. Vol. 1. Madrid: Imprenta y Libreria de M. Fernández, 1740.
Bellin, Jacques Nicolas. *Carte des Environs de Bayonne et les Costes jusqu'a a Fontarabie* [map], No scale given, Paris: 1764, Archivo Museo Naval, MN-MN-6708-96
———. *Carte du Canal de Languedoc Depuis Toulouse jusqu'a l'Etang de Marceillette* [map], No scale given, Paris: 1764, Archivo Museo Naval, MN-MN-6708-105
———. *Coste de Languedoc et Roussillon Depuis Lecaute Jusqu'a Port Vendre* [map], No scale given, Paris: 1764, Archivo Museo Naval, MN-MN-6708-100.

Benton, Lauren. *A Search for Sovereignty: Law and Geography in European Empires, 1400--1900*. Cambridge: Cambridge University Press, 2010.
Berlin, Ira, and Philip D Morgan, eds. *The Slaves' Economy: Independent Production by Slaves in the Americas*. London: Frank Cass, 1991.
Bernabéu Albert, Salvador. "El Tratado de Limites de 1792. Repercusiones del Tratado de Tordesillas en el Pacifico Septentrional." In *El Tratado de Tordesillas y su Epoca: Congreso Internacional de Historia*, 3:1701–1713. [Valladolid]; [Tordesillas]; [Setúbal]: Junta de Castilla y León; V Centenario del Tratado de Tordesillas; Comemorações Descobrimentos Portugeses, 1995.
Bernardo Ares, José Manuel de. "Los embajadores franceses en España: Primeros ministros de la Monarquía hispánica (1701-1709)." In *La proyección de la monarquía hispánica en Europa: política, guerra y diplomacia entre los siglos XVI y XVIII*, edited by Rosario Porres Marijuán and Iñaki Reguera, 121–145. Bilbao: Universidad del País Vasco, Servicio editorial = Eukal Herriko Unibertsitatea, Argitalpen Zertbitzua, 2009.
Biblia sacra: iuxta Vulgatam versionem. Stuttgart: Deutsche Bibelgesellschaft, 1994.
Biggs, Michael. "Putting the State on the Map: Cartography, Territory, and European State Formation." *Comparative Studies in Society and History* 41, no. 2 (1999): 374–405.
Black, Jeremy. *British Diplomats and Diplomacy, 1688-1800*. Exeter: University of Exeter Press, 2001.
———. "Change in Ancien Regime International Relations: Diplomacy and Cartography, 1650-1800." *Diplomacy & Statecraft* 20, no. 1 (2009): 20–29.
———. *Maps and Politics*. Chicago: University of Chicago Press, 1997.
Blair, Ann M. *Too Much to Know: Managing Scholarly Information before the Modern Age*. Yale University Press, 2010.
Bleichmar, Daniela. "Exploration in Print: Books and Botanical Travel from Spain to the Americas in the Late Eighteenth Century." *Huntington Library Quarterly* 70, no. 1 (March 1, 2007): 129–151.
———. "Painting as Exploration: Visualizing Nature in Eighteenth-Century Colonial Science." *Colonial Latin American Review* 15, no. 1 (June 1, 2006): 81–104.
———. *Visible Empire. Colonial Botany and Visual Culture in the Eighteenth-Century Hispanic World.* Chicago: University of Chicago Press, 2012.
Bleichmar, Daniela, Paula De Vos, Kevin Sheehan, and Krisitin Huffine, eds. *Science in the Spanish and Portuguese Empires, 1500-1800*. Stanford, Calif: Stanford University Press, 2009. (accessed May 28, 2010).
Bougainville, Louis-Antoine. *The Pacific Journal of Louis-Antoine de Bougainville, 1767-1768*. Translated by John Dunmore. 3rd 9. London: Hakluyt Society, 2002.
Bowen, Margarita. *Empiricism and Geographical Thought: from Francis Bacon to Alexander von Humboldt*. New York: Cambridge University Press, 1981.
Brading, D. A. "Bourbon Spain and its American Empire." In *The Cambridge History of Latin America*, edited by Leslie Bethell, 1:398–439. New York: Cambridge University Press, 1984.
Branch, Jordan. *The Cartographic State: maps, territory and the origins of sovereignty*. Cambridge: Cambridge University Press, 2014.

Breisach, Ernst. *Historiography: ancient, medieval and modern*. Chicago: Univ. of Chicago Press, 1994.
Brentjes, Sonja. "The Representation of Iran in Western Maps from 1300 to 1840." *Archives internationales d'histoire des sciences.* 60, no. 165 (2010): 457–475.
Broc, Numa. "Geography." Edited by Michel Delon. *Encyclopedia of the Enlightenment*. Chicago, IL; London: Fitzroy Dearborn Publishers, 2001.
Brotons, Víctor, and William Eamon, eds. *Mas allá de la Leyenda Negra: España y la revolución científica/Beyond the Black Legend: Spain and the Scientific Revolution*. Valencia: Instituto de Historia de la Ciencia y Documentación López Piñero; Universitat de Valéncia; C.S.I.C., 2007.
Brotton, Jerry. *A History of the World in Twelve Maps*. New York: Viking, 2013.
Brückner, Martin, ed. *Early American Cartographies*. Chapel Hill, NC: University of North Carolina Press; Omohundro Institute of Early American History & Culture, 2011.
Bueno, Antonio González. "Pehr Löfling in the Orinoco: a disciple of Carl Linnaeus in the Orinoco (1754-1756)." *Real Jardín Botanico de Madrid*, n.d. http://www.rjb.csic.es/jardinbotanico/jardin/index.php?Pag=87. (accessed March 27, 2013).
Buissert, David. "Spanish Colonial Cartography, 1450-1700." In *History of Cartography*, edited by John Brian Harley and David Woodward, 3:1143–1171. Chicago: University of Chicago Press, 1987.
———. "Spanish Peninsular Cartography, 1500-1700." In *History of Cartography*, edited by John Brian Harley and David Woodward, 3:1069–1094. Chicago: University of Chicago Press, 1987.
Burbank, Jane, and Frederick Cooper. *Empires in World History: Power and the Politics of Difference*. Princeton University Press, 2011.
Burnett, D. Graham. "Hydrographic Discipline among the Navigators: Charting an 'Empire of Commerce and Science' in the Nineteenth-Century Pacific." In *The Imperial Map: Cartography and the Mastery of Empire*, edited by James Akerman, 185–259. Chicago: University of Chicago Press, 2009.
Buschmann, Rainer F. *Iberian Visions of the Pacific Ocean, 1507-1899*. Basingstoke: Palgrave Macmillan, 2014.
Camarero Bullón, Concepción. "El Catastro de Ensenada, 1749-1759: diez años de intenso trabajo y 80.000 volúmenes manuscritos." *CT/Catastro* 46 (December 2002): 61–88.
———. "Informe del Consejo de Hacienda a Carlos III sobre el Catastro de Ensenada, 1779." *CT/Catastro* 51 (July 2004): 67–107.
———. "La cartografía en el catastro de Ensenada, 1750-1756." *Estudios geográficos* 59, no. 231 (1998): 245–283.
Campanella, Tommaso 1568-1639. *La città del sole: dialogo poetico = The City of the Sun: a poetical dialogue*. Translated by Daniel J. Donno. Berkeley: University of California Press, 1981.
Campillo y Cosío, José del. *Nuevo sistema de gobierno económico para la América con los males y daños que le causa el que hoy tiene, de los que participa copiosamente España; y remedios universales para que la primera tenga considerables ventajas, y la segunda mayores intereses*. Madrid: En la Imprenta de Benito Cano, 1789.

Cañizares-Esguerra, Jorge. “Chivalric Espistemology and Patriotic Narratives: Iberian Colonial Science.” In *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World*, 7–13. Stanford, Calif: Stanford University Press, 2006.

———. “Eighteenth-Century Spanish Political Economy.” In *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World*, 96–111. Stanford, Calif: Stanford University Press, 2006.

———. “How Derivative Was Humboldt? Microcosmic Narratives in Early Modern Spanish America and the (Other) Origins of Humboldt’s Ecological Sensibilties.” In *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World*, 112–128. Stanford, Calif: Stanford University Press, 2006.

———. *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World*. Stanford, Calif: Stanford University Press, 2006.

Capel, Horacio. “Los diccionarios geográficos de la ilustración española.” *Geo-crítica. Cuadernos críticos de geografía humana* 31 (January 1981): 3–49.

Carrillo de Albornoz y Galbeño, Juan. *Los ingenieros militares Juan y Pedro Zermeño: paradigmas de la Ilustración*. (Cuadernos del Castillo de San Fernando). Madrid: Ministerio de Defensa, 2012.

Carta de la Entrada de S. Lorenzo de Nutka sita en el grado 49 33ms de Lat. N. Y 249 ms Long. del meridº de Tenerife. Las letras ABCD son Rancherías [Manuscript map], No scale given, 1791. Archivo Histórico Nacional Estado,MPD.5.

Carta náutica de la isla de Nutka en la costa occidental [Manuscript map], No scale given, [1785?]. Archivo Museo Naval, MPD, MN-2-D-11.

Casado Arboniés, Manuel. “Bajo el signo de la militarización: las primeras expediciones científicas ilustradas a Suramérica (1735-1761).” In *La ciencia española en ultramar: actas de las I Jornadas sobre “España y las Expediciones Científicas en América y Filipinas”, Ateneo de Madrid, [11 al 22 de marzo de 1991]*, edited by Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández, 19–47. Aranjuez: Doce Calles, 1991.

Chapin, Seymour L. “Godin, Louis.” *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner’s Sons, 2008.

Christian, William A. *Local Religion in Sixteenth-century Spain*. Princeton University Press, 1989.

Cintra, Jorge Pimentel, and Júnia Ferreira Furtado. “A Carte de l’Amérique Méridionale de Bourguignon D’Anville: eixo perspectivo de uma cartografia amazônica comparada.” *Revista Brasileira de História* 31, no. 62 (2011): 273–316.

La Condamine, Charles Marie de. *Relation abrégée d’un voyage fait dans l’interieur de l’Amérique méridionale depuis la côte de la Mer du Sud jusqu’aux côtes du Brésil et de la Guiane, en descendant la Rivière des Amazones*. Paris: Veuve Pissot, 1745.

La Condamine, Charles-Marie de. *Extracto del Diario de observaciones hechas en el viage De la Provincia de Quito al Pará, por el Rio de las Amazonas; y del Pará a Cayana, Surinam y Amsterdam: destinado para ser leido en... la Academia Real de las Ciencias de Paris...* Amsterdam: En la Emprenta de Joan Catuffe, 1745.

Constitución politica de la monarquia española, promulgada en Cadiz a 19 de marzo de 1812. Madrid: Impr. nacional, 1820.

Cook, Harold John. *Matters of Exchange: Commerce, Medicine, and Science in the Dutch Golden Age*. New Haven: Yale University Press, 2007.

Cortezo, María Victoria López-Cordón. "De monarquía a nación: la imagen histórica de España en el siglo de la Ilustración." *Norba. Revista de historia*, no. 19 (2006): 151–173.

De la Costa, Horacio. "Jesuit Education in the Philippines to 1768." *Philippine Studies: Historical and Ethnographic Viewpoints* 4, no. 2 (1956): 127–156.

Cowans, Jon, ed. "Philip V, Decrees on Political Centralization (1707, 1716)." In *Early Modern Spain: A Documentary History*, translated by Arthur Helps, 203–206. Philadelphia: University of Pennsylvania Press, 2003.

Crespo Sanz, Antonio. "La imprenta y las técnicas de grabado como elemento de difusión de los mapas." In *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*, edited by Mariano Cuesta Domingo and Alfredo Surroca Carrascosa, 361–373. Madrid: Ministerio de Defensa, 2010.

———. "Los atlas de españa entre 1503 y 1810." In *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*, edited by Mariano Cuesta Domingo and Alfredo Surroca Carrascosa, 175–197. Madrid: Ministerio de Defensa, 2010.

Cro, Stelio, ed. *Descripcion de la Sinapia, peninsula en la tierra austral: A Classical Utopia of Spain*. Hamilton, Ont.: McMaster University, 1975.

Cruz Cano y Olmedilla, Juan de la. *Mapa geográfico de América Meridional dispuesto y gravado por D. Juan de la Cruz Cano y Olmedilla, geógrafo pensionistado de S.M., individuo de la Real Academia de San Fernando, y de la Sociedad Bascongada de los Amigos del País, teniendo presentes varios Mapas y noticias originales con arreglo á Observaciones astronómicas, Año 1775* [map] 1:4,250,000. 218 cm x 174 cm, [8 sheets of 56 cm x 88 cm.] Madrid: 1775.

Cuesta Domingo, Mariano, and Alfredo Surroca Carrascosa, eds. *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*. Madrid: Ministerio de Defensa, 2010.

Curtin, Philip D. *The Rise and Fall of the Plantation Complex: Essays in Atlantic History*. Cambridge: Cambridge University Press, 1990.

Daniels, Stephen. "Geographical Imagination." *Transactions of the Institute of British Geographers* 36, no. 2 (2011): 182–187.

Danson, Edwin. *Drawing the Line: How Mason and Dixon Surveyed the Most Famous Border in America*. New York: John Wiley, 2001.

Davenport, Frances G., ed. *European Treaties Bearing on the History of the United States and its Dependencies to 1648*. Washington, D.C., Carnegie Institution of Washington, 1917.

Delambre, Jean B. J. *Rapport historique sur les progrès des sciences mathématiques depuis 1789, e sur leur état actuel: présenté à Sa Majesté l'Empereur et Roi, en son Conseil d'état le 6. Février 1808*. Paris: Impr. impériale, 1810.

Delon, Michel, ed. *Encyclopedia of the Enlightenment*. 2 vols. Chicago, IL; London: Fitzroy Dearborn Publishers, 2001.

Derrotero de las costas de España en el Mediterraneo, y su correspondiente de Africa para inteligencia y uso de las cartas esféricas presentadas al rey nuesto señor pro el. exc.mo Sr. Baylío Fr. Don. Antonio Valdés, Gese de Esquadra y Secretario de Estado, y del Despacho Universal de Marina. Y construidas de orden de S.M. por el Brigadier de la Real Armada Don Vincente Tofiño de San Miguel, Director de las Academias de Guardias Marinas, de la Real Academia de la Historia,

correspondiente de la de las Ciencias de París. Madrid: por la Viuda de Ibarra, Hijos y Compañia, 1787.

Derrotero de las costas de Espana en el oceano Atlantico, y de las islas Azores o Terceras, para inteligencia y uso de las cartas esfericas presentadas al rey nuestro senor por el exc. Sr. baylio Fr. Don Antonio Valdes. Madrid: por la Viuda de Ibarra, hijos y compania, 1787.

Dettelbach, Michael. "Humboltdian Science." In *Cultures of Natural History*, edited by Nicholas Jardine, James A. Secord, and Emma C. Spary, 287–304. Cambridge: Cambridge University Press, 1996.

Dew, Nicholas. "Scientific travel in the Atlantic world: the French expedition to Gorée and the Antilles, 1681-1683." *British Journal for the History of Science* 43, no. 156 (2010): 1–18.

Díez Torre, Alejandro, Tomás Mallo, and Daniel Pacheco Fernández, eds. *De la ciencia ilustrada a la ciencia romántica: actas de los II jornadas sobre "España y las Expediciones en América y Filipinas"*. Madrid: Ed. Doce Calles, 1995.

———. *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*. Aranjuez: Doce Calles, 1991.

Dirección Hidrográfica de España. *Atlas Maritimo de América y Oceania*. Madrid: Dirección Hidrográfica de España, 1816.

———. *Atlas marítimo de las costas de las posesiones españolas en América*. Madrid: Dirección Hidrográfica de España, 1805.

Djenderedjian, Julio. "Roots of Revolution: Frontier Settlement Policy and the Emergence of New Spaces of Power in the Río de la Plata Borderlands, 1777-1810." Translated by Jane Ramírez. *Hispanic American Historical Review* 88, no. 4 (November 2008): 639–668.

Dominguez, Luis L., ed. *Conquest of the River Plate (1535-1555): Translated for the Hakluyt Society with Notes and an Introduction*. Cambridge: Cambridge University Press, 2010.

Díez de Ulzurrun, Javier María Donézar. "Los decretos de la Real Hacienda de 1749: los poderes locales y la representación del reino." *Historia moderna* 12 (1999): 297–320.

Donoso, Ricardo. "El mapa de la América meridional de la Cruz Cano y Olmedilla." *Revista Chilena de Historia y Geografía* 131 (1963): 121–175.

Durant, Will, and Ariel Durant. *The Age of Louis XIV: a History of European Civilization in the Period of Pascal, Molière, Cromwell, Milton, Peter the Great, Newton, and Spinoza: 1648-1715*. New York: Simon and Schuster, 1963.

Dym, Jordana, and Karl Offen, eds. *Mapping Latin America*. Chicago: The University of Chicago Press, 2011.

Edney, Matthew H. *Mapping an Empire: the Geographical Construction of British India, 1765-1843*. Chicago: University of Chicago Press, 1997.

Ehrensvärd, Ulla. "Color in Cartography: A Historical Survey." In *Art and Cartography: Six Historical Essays*, edited by David Woodward, 123–146. Chicago: University of Chicago Press, 1987.

El Tratado de Tordesillas y su Epoca: Congreso Internacional de Historia. 3 vols. [Valladolid]; [Tordesillas]; [Setúbal]: Junta de Castilla y León; V Centenario del Tratado de Tordesillas; Comemorações Descobrimentos Portugeses, 1995.

Elliott, J. H. "A Europe of Composite Monarchies." *Past and Present*, no. 137 (1992): 48–71.

———. *Empires of the Atlantic World: Britain and Spain in America, 1492-1830*. New Haven: Yale University Press, 2006.

———. "Europe after the Peace of Westphalia." In *Spain, Europe & the Wider World, 1500-1800*, 92–106. New Haven: Yale University Press, 2009.

———. "Learning from the Enemy: Early Modern Britain and Spain." In *Spain, Europe & the Wider World, 1500-1800*, 25–51. New Haven: Yale University Press, 2009.

———. *Spain, Europe & the Wider World, 1500-1800*. New Haven: Yale University Press, 2009.

Elliott, John H. *The Count-Duke of Olivares: the statesman in an age of decline*. New Haven: Yale University Press, 1990.

Elliott, John. *Imperial Spain, 1469-1716*. New York: St. Martin's Press, 1964.

———. "Revolution and Continuity in Early Modern Europe." In *Spain and Its World, 1500-1700: Selected Essays*, 92–113. New Haven: Yale University Press, 1989.

———. *Spain and Its World, 1500-1700: Selected Essays*. New Haven: Yale University Press, 1989.

———. "The Decline of Spain." In *Spain and Its World, 1500-1700: Selected Essays*, 217–240. New Haven: Yale University Press, 1989.

Engstrand, Iris Wilson. *Spanish Scientists in the New World: The Eighteenth-Century Expeditions*. Seattle: University of Washington Press, 1981.

Escobar, Jesús. "Map as Tapestry: Science and Art in Pedro Teixeira's 1656 Representation of Madrid." *Art Bulletin* 96, no. 1 (2014): 50–69.

Esdaile, Charles J. *The Peninsular War: a new history*. New York: Palgrave MacMillan, 2003.

España dividida en provincias é intendencias, y subdividida en partidos, corregimientos, alcaldias mayores: obra formada por relaciones originales qe. de orden de S.M. se pidieron por su ministro de Estado, Conde de Floridablanca, en 22 de Marzo de 1785, con un nomenclator o Diccionario de todos los pueblos del Reino, que compone la segunda parte. Madrid: Imprenta Real, 1789.

Feijóo, Benito Jerónimo. *Teatro crítico universal, o, Discursos varios en todo género de materias, para desengaño de errores comunes*. 9 vols. Madrid: en la imprenta de Francisco del Hierro, 1729.

Fernández de Mesa y Moreno, Tomás Manuel. *Tratado legal, y politico de caminos publicos, y possadas. Dividido en dos partes. La una, en que se hable de los caminos; y la otra, de las possadas: y como anexo, de los correos, y postas, assi publicas, como privadas: donde se incluye el Reglamento general de aquellas, expedido en 23. de abril de 1720.* Valencia: J.T. Lucas, 1755.

Fernández Fraile, Maria Eugenia. "Juan Antonio González Cañaveras y la enseñanza de lenguas en el siglo XVIII." *Documents pour l'histoire du français langue étrangère ou seconde* 42 (June 1, 2009): 87–108.

Ferreira, Mário Clemente. "O Mapa das Cortes e o Tratado de Madrid: a cartografia a serviço da diplomacia." *Varia História* 23, no. 37 (2007): 51–69.

Ferreiro, Larrie D. *Ships and Science: the birth of naval architecture in the scientific revolution, 1600-1800*. Cambridge, Mass.: MIT Press, 2007.
FitzRoy, Robert. *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle, between their years 1826 and 1836, describing their examination of the southern shores of South America and the Beagle's circumnavigation of the globe*. Vol. 1. 3 vols. London: Henry Colburn, Great Malborough Street, 1839.
Conde de Floridablanca, José Moñino. *Obras originales del Conde de Floridablanca y escritos referentes a su persona*. Edited by Antonio Ferrer del Río. Madrid: Imprenta de Hernando y compañia, 1899.
Franco, Matthew E. "Bridging the Divide: Science and Reform in the Spanish Navy (1783-1805)". Master's Essay, Baltimore, MD: The Johns Hopkins University, 2011.
Fritz, Samuel. *Journal of the Travels and Labours of Father Samuel Fritz in the River of the Amazons between 1686 and 1723*. Nendeln, Lichtenstein: Kraus Repr, 1967.
Fuentes Crispín, Nara. "Triángulos y anhelos de precisión. Entre la geografía de escritorio y la geografía de campo: discurso y gabinete de Juan Polo y Catalina." *Memoria y Sociedad* 16, no. 32 (January 2012): 87–102.
Galland Seguela, Martine. *Les ingénieurs militaires espagnols de 1710 à 1803: étude prosopographique et sociale d'un Corps d'élite*. Bibliothèque de la Casa de Velázquez, 40. Madrid: Casa de Velázquez, 2008.
Garner, Bryan A., ed. *Black's Law Dictionary*. 9th ed. St. Paul, MN: West, 2009.
Gillispie, Charles Coulston, Frederic Lawrence Holmes, and Noretta Kiertge, eds. *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.
Gingerich, Owen. "Lacaille, Nicolas-Louis De." *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.
Glacken, Clarance J. *Traces on the Rhodian shore: nature and culture in Western thought from ancient times to the end of the eighteenth century*. Berkeley: University of California Press, 1973.
Godlewska, Anne. "Traditions, Crisis, and New Paradigms in the Rise of the Modern French Discipline of Geography 1760--1850." *Annals of the Association of American Geographers* 79, no. 2 (June 1989): 192–213.
Gómez, Andrés Galera. "Antonio Pineda y el Proyecto Cientifico de la Expedicion Malaspina." In *La ciencia española en ultramar: actas de las I Jornadas sobre "España y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991]*, edited by Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández, 257–263. Aranjuez: Doce Calles, 1991.
Gómez Urdáñez, José Luis. *El proyecto reformista de Ensenada*. Lleida [Spain]: Milenio, 1996.
González Cañaveras, Juan Antonio. *Método para aprender por principios la Geografía general y particular antigua y moderna, sagrada y eclesiástica, y la cronología y esfera celeste y terrestre [...]*. 5 vols. Madrid: en la oficina de Cano, 1793.
González Cañaveras, Juan Antonio. *Plan de educación rexposición de un nuevo methodo para estudiar...* Cadiz: Manuel Espinosa de los Monteros, 1767.
González Cañaveras, Juan Antonio. *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos*. Madrid: en la Imprenta de Cano, 1800.

———. *Planisferio ó Carta general de la Tierra, segun los últimos descubrimientos* [map], No scale given. Madrid: en la Imprenta de Cano, 1800. Biblioteca de Palacio Real (BPR) MAP/85 (29-40).

Gonzalez Cañaveras, Juan Antonio. *Planisferio ó carta general de la tierra: Madrid 1800*. Edited by W. Michael Mathes. Madrid: Ediciones José Porrúa Turanzas, 2009.

González González, Francisco. *Instrumentos Científicos del Observatorio de San Fernando: (siglos XVIII, XIX, XX)*. Madrid: Instituto de Historia y Cultura Naval, 1995.

González-Ripoll Navarro, Ma. Dolores, and Cosme Damián de Churruca y Elorza. *Trinidad: la otra llave de América: descripción de la isla de Trinidad por Cosme de Churruca y la expedición del Atlas de la América Septentrional, 1792/1810*. Caracas: Lagoven, 1992.

González-Ripoll Navarro, Ma. Dolores, and Luis Miguel García Mora. *El caribe en la época de la independencia y las nacionalidades*. Morelia, Mexico: Universidad Michoacana de San Nicolás de Hidalgo, Instituto de Investigaciones Históricas, Departamento de Historia Latinoamericana, 1997.

González-Ripoll Navarro, María Dolores. "La Formación Académica y Práctica de Los Marinos del Siglo XVIII: Cosme de Churruca (1761-1805), un Oficial Científico." In *De la ciencia ilustrada a la ciencia romántica: actas de los II jornadas sobre "España y las Expediciones en América y Filipinas"*, edited by Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández, 312–323. Madrid: Ed. Doce Calles, 1995.

Guerlac, Henry. "Lavoisier, Antoine-Laurent." *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.

———. "Sage, Balthazar-Georges." *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.

Gusmão, Alexandre de. *Mapa dos Confins do Brasil com as terras da Coroa de Espanha na América, ou Mapa das Cortes* [map]. Scale not given. In Jorge Pimentel Cintra and Júnia Ferreira Furtado, "A Carte de l'Amérique Méridionale de Bourguignon D'Anville: eixo perspectivo de uma cartografia amazônica comparada," *Revista Brasileira de História* 31, no. 62 (2011): 281.

Haguet, Lucile. "J.-B. d'Anville as Armchair Mapmaker: The Impact of Production Contexts on His Work." *Imago Mundi* 63, no. 1 (January 2011): 88–105.

Hahn, Roger. *The Anatomy of a Scientific Institution: the Paris Academy of Sciences, 1666-1803*. Berkeley: University of California Press, 1971.

Hamilton, Earl J. "Plans for a National Bank in Spain, 1701-83." *Journal of Political Economy* 57, no. 4 (August 1, 1949): 315–336.

Hankins, Thomas. "Blood, Dirt, and Nomograms: A Particular History of Graphs." *Isis* 90, no. 1 (1999): 50.

———. "Lalande, Joseph-Jérôme Lefrançais De." *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.

———. "Le Monnier, Pierre-Charles." *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.

Hargreaves-Mawdsley, W. N. *Eighteenth-Century Spain, 1700-1788: A Political, Diplomatic and Institutional History*. Totowa, N.J.: Rowman and Littlefield, 1979.

Harley, J. B. “Maps, Knowledge, Power.” In *The New Nature of Maps: Essays in the History of Cartography*, edited by Paul Laxton, 51–82. Baltimore, MD: Johns Hopkins University Press, 2001.
———. “Power and Legitimation in the English Geographical Atlases of the Eighteenth Century.” In *The New Nature of Maps: Essays in the History of Cartography*, edited by Paul Laxton, 110–147. Baltimore, MD: Johns Hopkins University Press, 2001.
———. “Silences and Secrecy: The Hidden Agenda of Cartography in Early Modern Europe.” In *The New Nature of Maps: Essays in the History of Cartography*, edited by Paul Laxton, 84–107. Baltimore, MD: Johns Hopkins University Press, 2001.
———. *The New Nature of Maps: Essays in the History of Cartography*. Edited by Paul Laxton. Baltimore, MD: Johns Hopkins University Press, 2001.
Harley, John Brian, and David Woodward, eds. *History of Cartography*. 6 vols. Chicago: University of Chicago Press, 1987.
Hernández Andreu, Juan. “La Única Contribución del Marqués de la Ensenada y el impuesto único de la Escuela Fisiócrata.” *Moneda y Crédito*, no. 117 (1971): 67–79.
Herr, Richard. *Rural Change and Royal Finances in Spain at the End of the Old Regime*. Berkeley: University of California Press, 1989.
———. *The Eighteenth-Century Revolution in Spain*. Princeton: Princeton University Press, 1958.
Herzog, Tamar. *Defining Nations: Immigrants and Citizens in Early Modern Spain and Spanish America*. New Haven: Yale University Press, 2003.
Hess, Jonathan M. *Reconstituting the Body Politic: Enlightenment, Public Culture and the Invention of Aesthetic Autonomy*. Wayne State University Press, 1999.
Hewitt, Rachel. *Map Of A Nation: A Biography Of The Ordnance Survey*. Granta Books, 2011.
Howe, Nicholas, ed. *Visions of Community in the Pre-Modern World*. Notre Dame: University of Notre Dame Press, 2002.
Iliffe, R. “Science and Voyages of Discovery.” In *The Cambridge History of Science, vol. 4: Eighteenth-Century Science*, edited by Roy Porter, 618–45. Cambridge [England]: Cambridge University Press, 2003.
Israel, Fred L., ed. *Major Peace Treaties of Modern History, 1648-1967*. Vol. 1. New York: Chelsea House Publishers, 1967.
Jiménez Garcés, José Andrés. “El mapa de la América meridional (1775) de Cano y Olmedilla.” In *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*, edited by Mariano Cuesta Domingo and Alfredo Surroca Carrascosa, 218–219. Madrid: Ministerio de Defensa, 2010.
Jovellanos, Gaspar de. *Informe de la Sociedad Económica de esta Corte al Real y Supremo Consejo de Castilla en el expediente de ley agraria*. Madrid: En la imprenta de Sancha, 1795.
———. *Obras publicadas é inéditas de D. Gaspar Melchor de Jovellanos*. Edited by Candido Nocedal. 2 vols. Madrid: M. Rivadeneyra, 1858.
Juan, Jorge, and Antonio de Ulloa. *Noticias secretas: sobre el gobierno, administración de justicia, estado del clero y costumbres entre los indios del interior*. Barcelona: Crítica, 2010.

———. *Observaciones astronómicas y phisicas hechas ... en los Reynos del Perú por D. Jorge Juan ... y D. Antonio de Ulloa ... de las quales se deduce la figura y magnitud de la Tierra y se aplica a la Navegación*. En Madrid: por Juan de Zuñiga, 1748.
———. *Relacion historica del viage a la America Meridional hecho de orden de S. Mag. para medir algunos grados de meridiano terrestre y venir por ellos en conocimiento de la verdadera figura y magnitud de la tierra, con otras observaciones astronomicas y phisicas*. Madrid: por Antonio Marin, 1748.
Juan y Santacilia, Jorge, and Antonio de Ulloa. *Dissertacion historica y geographica sobre el meridiano de demarcacion entre los dominios de España, y Portugal etc.* Madrid: En la Imprenta de Antonio Marin, 1749.
Kagan, Richard. "Community and Cartography in the Hispanic World." In *Visions of Community in the Pre-Modern World*, edited by Nicholas Howe, 149–178. Notre Dame: University of Notre Dame Press, 2002.
Kagan, Richard L. "Arcana Imperii: Mapas, Sabiduría, y Poder a la corte de Felipe IV." In *El Atlas del Rey Planeta: la descripción de España y de las costas y puertos de sus reinos de Pedro Texeira (1634)*, edited by Felipe Pereda and Fernando Marías, 49–70. Hondarribia: Nerea, 2002.
———. "Projecting Order." In *Mapping Latin America*, edited by Jordana Dym and Karl Offen, 46–50. Chicago: The University of Chicago Press, 2011.
Kagan, Richard. *Urban Images of the Hispanic World, 1493-1793*. New Haven: Yale University Press, 2000.
Kapoor, Satish C. "Berthollet, Claude Louis." *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.
Kenny, Kevin, ed. *Ireland and the British Empire*. New York: Oxford University Press, 2004.
Konvitz, Josef W. *Cartography in France, 1660-1848: science, engineering, and statecraft*. Chicago: University of Chicago Press, 1987.
Kuethe, Allan J., and Kenneth J. Andrien. *The Spanish Atlantic World in the Eighteenth Century: War and the Bourbon Reforms, 1713–1796*. New York: Cambridge University Press, 2014.
De Lacaille, Nicolas Louis. *Leçons élémentaires d'Astronomie*. Paris, 1746.
———. *Leçons élémentaires d'Optique*. Paris, 1750.
———. *Leçons élémentaires de Mathématiques*. Paris, 1741.
———. *Leçons élémentaires de Mécanique*. Paris, 1743.
Lafuente, Antonio, and Leoncio López-Ocón. "Scientific Traditions and Enlightenment Expeditions in Eighteenth-century Hispanic America." In *Science in Latin America: A History*, edited by Juan José Saldaña, translated by Bernabé Madrigal, 123–150. Austin: University of Texas Press, 2006.
Lafuente, Antonio. *Los Caballeros del Punto Fijo: ciencia, política y aventura en la expedición geodésica hispanofrancesa al virreinato del Perú en el siglo XVIII.* Quito Ecuador: Ediciones ABYA-YALA, 1992.
Lafuente, Antonio, and José Luis Peset. "Las Academias Militares y la inversión en ciencia en la España ilustrada (1750-1760)." *Dynamis: Acta Hispanica ad Medicinae Scientiarumque Historiam Illustrandam* 2 (1982): 193–209.
———. "Política científica y espionaje industrial en los viajes de Jorge Juan y Antonio de Ulloa (1748-1751)." *Melanges de la Casa de Velázquez* 17 (1981): 233–262.

Lafuente, Antonio, and Manuel Sellés. *El Observatorio de Cádiz (1753-1831)*. Madrid: Ministerio de Defensa; Instituto de Historia y Cultura Naval, 1988.
Líter, Carmen. *La obra de Tomás López: imagen cartográfica del siglo XVIII*. Madrid: Biblioteca Nacional, 2002.
Líter, Carmen, and Francisca Sanchis. *Tomás López y sus colaboradores*. Madrid: Ministerio de Educación y Cultura, Biblioteca Nacional, 1998.
Locher, Fabian. "The Observatory, the Land-Based Ship and the Crusades: Earth Sciences in European Context, 1830-50." *The British Journal for the History of Science* 40, no. 4 (December 1, 2007): 491–504.
Lodge, Richard, ed. *The Private Correspondence of Sir Benjamin Keene, K.B.* Cambridge: Cambridge University Press, 2015.
López Cruchet, Julián. "El filósofo Juan de Nájera y la Ilustración en España." *Anales del Seminario de Historia de la Filosofía* 20 (January 1, 2003): 269 – 283.
López de Vargas Machuca, Tomás. *Atlas geographico del reyno de España è islas adjacentes con una breve descripcion de sus provincias: dispuesto para la utilidad publica*. Hallàrase en Madrid: en casa de D. Antonio Sanz ..., 1757.
———. *Descripcion de la provincia de Madrid*. Madrid: Por Joachin Ibarra, 1763.
———. *Mapa geográfico que comprehende la Nueva Inglaterra, Nueva York, Nueva Jersey, Pensilvania, Maryland y parte de Virginia* [map], No scale given, 1778. Cartoteca, Centro Geográfico de Ejército SG-Arm.1-90-N.79.
———. *Plano de la Isla y Puerto de Santa Catalina situado en la America Meridional* [map], No scale given, 1777. Archivo Histórico Nacional Estado Proc. Leg. 2842 Sig. 104
———. *Principios geograficos, aplicados al uso de los mapas*. Madrid: J. Ibarra, 1775.
López, Fernando Durán. *José Vargas Ponce, 1760-1821: ensayo de una bibliografía y crítica de sus obras*. Cádiz: Servicio Publicaciones, Universidad de Cádiz, 1997.
López Gómez, Antonio. *Cartografía del siglo XVIII: Tomás López en la Real Academia de la Historia*. Madrid: Real Academia de la Historia, Departamento de Cartografía y Artes Gráficas, 2006.
López Piñero, José María. *La introducción de la ciencia moderna en España.* Barcelona: Ediciones Ariel, 1969.
López, Tomás. *Atlas geographico del reyno de España è islas adjacentes con una breve descripcion de sus provincias: dispuesto para la utilidad publica*. Se hallará en Madrid, calle de Atocha frente a la plazuela del Angel, No. 1, 1792.
Lynch, John. *Bourbon Spain, 1700-1808*. Oxford, UK: B. Blackwell, 1989.
Madrazo, Santos. *El sistema de comunicaciones en España, 1750-1850*. 2 vols. Madrid, Spain: Colegio de Ingenieros de Caminos, Canales y Puertos: Ediciones Turner, 1984.
Magalhães, João Jacinto de. *Description des octants et sextants anglois,: ou quarts de cercle a reflection, avec la maniere de se servir de ces instrumens, pour prendre toutes sortes de Distances angulaires, tant sur Mer que sur Terre. Précédée d'un Memoire sur une nouvelle Construction de ces Instrumens; Et suivie d'un Appendix, contenant la Description & les avantages d'un Double-Sextant nouveau. Par M. J. H. de Magellan, Membre de la Société Royale de Londres, & Correspondant de L'Académie Royale des Sciences de Paris*. Paris: chez Valade, Libraire, rue Saint-

Jacques, vis-à-vis celle des Mathurins. & à Londres, chez Elmsley, Libraire, dans le Strand, vis-à-vis Southampton Street, 1775.

Malaspina, Alessandro. *The Malaspina Expedition, 1789-1794: Journal of the Voyage by Alejandro Malaspina*. 3 vols. Works issued by the Hakluyt Society 3rd ser., no. 8. London: Hakluyt Society in association with the Museo Naval, Madrid, 2001.

Mancke, Elizabeth. "Empire and State." In *The British Atlantic World, 1500-1800*, edited by David Armitage and Michael J. Braddick, 175–195. New York: Palgrave Macmillan, 2002.

Manso Porto, Carmen. "El interrogatorio de Tomás López: nueva hipótesis sobre su finalidad." In *Historia, clima y paisaje: Estudios geográficos en memoria del profesor Antonio López Gómez*, 177–186. Madrid: Universidad Autónoma de Madrid, 2004.

Mapa de los dominios de España y Portugal, en la America Meridional [Manuscript map], 1º Lat. = 1,4 cm, 1750. Cartoteca, Centro Geográfico de Ejército Ar.J-T.9-C.3-30.

Mapa del puerto de Gibraltar, sitiada por el conde de las Torres [map], Scale not given, 1727. Archivo Histórico Nacional, Estado MPD.135.

Mapa Topográfico de los Montes Pirineos, Levantado baxo las escala de 6 líneas por 100 Tocsas, De orden de S.M. Catholica El Señor D. Carlos III y de S.M. Christianisima el Señor D. Luis XVI; por ocho Yngenieros Españoles y ocho Franceses de las ordenes de los Comisarios nombrados por las dos Coronas para la Demarcacion de Limites, los Mariscales de Campo D. Ventura Caro y el Conde de Ornano; y baxo la Direccion del Coronel de Yngenieros D. Antonio de Zara y del Teniente Cor. M. Gaultier del Kerveguen [map], No scale given, 1786-1789, Cartoteca, Centro Geográfico de Ejército, AR.H-T.5-C.8-237(a,b); AR.H-T.5-C.8-238(a,b); AR.H-T.5-C.8-239; AR.H-T.5-C.8-240(a-d), AR.H-T.5-C.8-241(a,b).

Mapp, Paul W. *The Elusive West and the Contest for Empire, 1713-1763*. Chapel Hill: University of North Carolina Press; Published for the Omohundro Institute of Early American History and Culture, 2011.

Marino, John. "Administrative Mapping in the Italian States." In *Monarchs, Ministers and Maps: The Emergence of Cartography as a Tool of Government in Early Modern Europe*, edited by James Akerman and David Buissert, 5–25. Chicago: University of Chicago Press, 1992.

Martin, Jean-Pierre. *Une histoire de la méridienne: textes, enjeux, débats et passions autour du méridien de Paris, 1666-1827*. Cherbourg: Isoète, 2000.

Martín-Merás, María Luisa. "L' 'Atlas Marítimo de España,' 1787-1789." In *Cicle de conferències presentat amb motiu del Symposium IMCOS*, 17–28. Barcelona: Institut Cartografic de Catalunya, 1986.

———. "La Expedición Hidrográfica del Atlas de la América septentrional, 1792-1805." *Journal of Latin American Geography* 7, no. 1 (2008): 203–218.

Martínez Almira, Magdalena. *Jorge Juan y las ciencias bajo el signo de la monarquía ilustrada*. Madrid, España: Alicante, 2002.

Martínez Martín, Carmen. "La cartografía política del Brasil colonial." In *Cartografía hispánica: imagen de un mundo en crecimiento, 1503-1810*, edited by Mariano Cuesta Domingo and Alfredo Surroca Carrascosa, 247–274. Madrid: Ministerio de Defensa, 2010.

Massey, Doreen. “The Geographical Mind.” In *Secondary Geography Handbook*, edited by David Balderstone, 46–51. Sheffield: Geographical Association, 2006.
Mathes, W. Michael. “Juan Antonio Gonzalez Cañaveras y Su Obra.” In *Planisferio ó carta general de la tierra: Madrid 1800*, 11–19. Madrid: Ediciones José Porrúa Turanzas, 2009.
Matilla Tascón, Antonio. *La única contribución y el catastro de la Ensenada*. Madrid: Servicio de Estudios de la Inspección General del Ministerio de Hacienda, 1947.
De la Maza, Francisco. “‘Aspecto simbólico del mundo hispánico.’ Grabado filipino del siglo XVIII.” *Anales del Instituto de Investigaciones Estéticas* 9, no. 33 (July 30, 1964): 5–21.
McClellan III, James E. *Science Reorganized: scientific societies in the eighteenth century*. New York: Columbia University Press, 1985.
Memije, Vicente de. *Theses Mathematicas de Cosmographia, Geographia, y Hydrographia, en qve el Globo Terraqveo se contempla por respecto al Mvndo Hispanico* ... Manila: Por D. Nicolas de la Cruz Bagay, 1761.
———. “*Aspecto Geographico del Mundo Hispanico: que a su Glorioso Catholico Rey Carlos Tercero el Magnanimo dedica, y consagra D. Vicente de Memije con IX Theses, y XC proposiciones, que acerca de el defiende presidiendo el R.P. Pasqual Fernandez, publico professor de mathematicas en la Universidad de Manila de la Compañía de Iesus Año de 1761* [map], No scale given. Manila, 1761. Cartoteca, Centro Geográfico de Ejército Ar.J.T.1-C.2-57.
———. *Aspecto Symbolico del Mundo Hispanico: puntualmente arreglado al Geografico, que a su Glorioso Catholico Rey D. Carlos Tercero el Magnanimo dedica, y consagra D. Vicente de Memije, con IX thoeses, y XC proposiciones, que a cerca de el defiende; presidiendo el R.P. Pasqual Fernandez, publico professor de mathematicas en la Universidad de Manila de la Comañia de Iesus Año de 1761* [map], No scale given. Manila, 1761. Cartoteca, Centro Geográfico de Ejército Ar.J-T.1a-C.2a-58.
Merle, Alexandra. “Société, noblesse et monarchie dance les ‘Cartas marruecas’.” In *Les Voies des Lumières: le monde ibérique au XVIIIe siècle*, edited by Carlos Serrano, Jean-Paul Duviols, and Annie Molinié-Bertrand, 113–140. Paris: Presses de l’Université de Paris-Sorbonne, 1998.
Merriman, John M. *A History of Modern Europe: from the Renaissance to the present*. 2nd ed. New York: W.W. Norton & Co., 2004.
Miller, Cecilia. *Giambattista Vico: imagination and historical knowledge*. New York: St. Martin’s Press, 1993.
Miquelon, Dale. “Ambiguous Concession: What Diplomatic Archives Reveal about Article 15 of the Treaty of Utrecht and France’s North American Policy.” *The William and Mary Quarterly* 67, no. 3 (July 2010): 459–486.
———. “Envisioning the French Empire: Utrecht, 1711-1713.” *French Historical Studies* 24, no. 4 (2001): 653–677.
Mitchell, Ken. “Science, Giants, and Gold: Juan de la Cruz Cano y Olmedilla’s Mapa Geográfico de la America Meridional.” *Terrae Incognitae* 31, no. 1 (January 1, 1999): 25–41.
More, Thomas. *Utopia*. Translated by Paul Turner. Reissued with new and updated editorial material. New York: Penguin Books, 2003.

Mundy, Barbara E. “Hybrid Space.” In *Mapping Latin America*, edited by Jordana Dym and Karl Offen, 51–55. Chicago: The University of Chicago Press, 2011.
———. *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas*. Chicago: University of Chicago Press, 1996.
Naddeo, Barbara. “A Cosmopolitan in the Provinces: G. M. Galanti, Geography, and Enlightenment Europe.” *Modern Intellectual History* 10, no. 01 (2013): 1–26.
Needham, Joseph. *Science and Civilisation in China*. Vol. 4, part 3. Cambridge: Cambridge University Press, 1971.
Nova y Colson, Pedro, ed. *Viaje político-científico alrededor del mundo por las corbetas Descubierta y Atrevida al mando de los capitanes de navío D. Alejandro Malaspina y Don José de Bustamante y Guerra, desde 1789 a 1794*. Madrid: Impr. de la viuda é hijos de Abienzo, 1885.
Ó Domhnaill, Séan. “The Maps of the Down Survey.” *Irish Historical Record* 3, no. 12 (1942): 381–92.
Ohlmeyer, Jane H. “A Laboratory for Empire?: Early Modern Ireland and English Imperialism.” In *Ireland and the British Empire*, edited by Kevin Kenny, 26–60. New York: Oxford University Press, 2004.
Ortega, Francisco. “Ni nación ni parte integral ‘Colonia’, de vocablo a concepto en el siglo XVIII iberoamericano.” *Prismas: Revista de historia intelectual* 15, no. 1 (2011): 11–29.
Osiander, Andreas. *The States System of Europe, 1640-1990: peacemaking and the conditions of international stability*. New York: Clarendon Press, 1994.
Padrón, Ricardo. “Allegory and Empire.” In *Mapping Latin America*, edited by Jordana Dym and Karl Offen, 84–87. Chicago: The University of Chicago Press, 2011.
———. “Charting Shores.” In *Mapping Latin America*, edited by Jordana Dym and Karl Offen, 33–37. Chicago: The University of Chicago Press, 2011.
———. “From Abstraction to Allegory: the Imperial Cartography of Vicente Memije.” In *Early American Cartographies*, edited by Martin Brückner, 35–66. Chapel Hill, NC: University of North Carolina Press; Omohundro Institute of Early American History & Culture, 2012.
———. “Mapping Plus Ultra: Cartography, Space, and Hispanic Modernity.” *Representations* 79, no. 1 (August 1, 2002): 28–60.
Pagden, Anthony. “Heeding Heraclides: empire and its discontents, 1619-1812.” In *Spain, Europe and the Atlantic World: Essays in honour of John H. Elliott*, edited by Richard Kagan and Geoffrey Parker, 316–333. Cambridge: Cambridge University Press, 2002.
Paquette, Gabriel B. *Imperial Portugal in the age of Atlantic revolutions: the Luso-Brazilian world, c. 1770-1850*. Cambridge: Cambridge University Press, 2013.
Paquette, Gabriel B. *Enlightenment, Governance and Reform in Spain and Its Empire, 1759-1808*. New York: Palgrave Macmillan, 2008.
Paquette, Gabriel. “Book Review: Empire, Enlightenment and Regalism: New Directions in Eighteenth-Century Spanish History.” *European History Quarterly* 35, no. 1 (2005): 107–117.
Paquette, Gabriel, ed. *Enlightened Reform in Southern Europe and its Atlantic Colonies, c. 1750-1830*. Burlington VT: Ashgate, 2009.

Paquette, Gabriel. “The Dissolution of the Spanish Atlantic Monarchy.” *The Historical Journal* 52, no. 01 (2009): 175–212.

Park, Katherine, and Lorraine Daston, eds. *The Cambridge History of Science*. Cambridge: Cambridge University Press, 2006. https://catalyst.library.jhu.edu/catalog/bib_4394924.

Parker, Geoffrey. “Maps and Ministers: The Spanish Habsburgs.” In *Monarchs, Ministers and Maps: The Emergence of Cartography as a Tool of Government in Early Modern Europe*, edited by James Akerman and David Buissert, 124–152. Chicago: University of Chicago Press, 1992.

Pedley, Mary. “Map Wars: the role of maps in the Nova Scotia/Acadia boundary disputes of 1750.” *Imago Mundi* 50, no. 1 (1998): 96–104.

Pedley, Mary Sponberg. *The Commerce of Cartography: Making and Marketing Maps in Eighteenth-Century France and England*. Chicago: University of Chicago Press, 2005.

Pelletier, Monique. “Cartography and Power in France During the Seventeenth and Eighteenth Centuries.” *Cartographica* 35, no. 3/4 (Autumn and Winter 1998): 41.

Peña Izquierdo-Portocarrero, Antonio Ramón. *De Austrias a Borbones: España Entre Los Siglos XVII Y XVIII*. Astorga, León: Akrón, 2008.

Peralta Ruiz, Víctor. “Diego de Alvear y Ponce de León.” In *Diccionario biográfico español*, edited by Icíar Gómez Hidalgo and Gonzalo Anes y Álvarez de Castrillón, 2:803–805. Madrid: Real Academia de la Historia, 2009.

Pereda, Felipe, and Fernando Marías, eds. *El Atlas del Rey Planeta: la descripción de España y de las costas y puertos de sus reinos de Pedro Texeira (1634)*. Hondarribia: Nerea, 2002.

Pickles, John. *A History of Spaces: cartographic reason, mapping, and the geo-coded world*. London; New York: Routledge, 2004.

———. “Mapping the geo-body: State, territory and nation.” In *A History of Spaces: cartographic reason, mapping, and the geo-coded world*, 107–123. London; New York: Routledge, 2004.

Pimentel Igea, Juan. “Imperio e Ideologia Colonial en Alejandro Malaspina.” In *La ciencia española en ultramar: actas de las I Jornadas sobre “España y las Expediciones Científicas en América y Filipinas”, Ateneo de Madrid, [11 al 22 de marzo de 1991]*, edited by Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández, 277–283. Aranjuez: Doce Calles, 1991.

———. *La física de la monarquía: ciencia y política en el pensamiento colonial de Alejandro Malaspina (1754-1810)*. Aranjuez: Doce Calles, 1998.

Pimentel, Juan. *Viajeros Científicos: Tres Grandes Expediciones Al Nuevo Mundo: Jorge Juan, Mutis, Malaspina*. Madrid: Nivola, 2001.

*Plano del Puerto de Nutka en la Costa N.O. de América, situado en la Latitud N. de 49º,33’, y en la Longitud de 21º,21’, al O del Meridiano de San Blas, que dista del de Tenerife 88º,50’,15” igualmente Occidenta*l [Manuscript map], No scale given, 1792. Archivo Histórico Nacional Estado,MPD.3

[*Plano original Frances de la Región de los Alduides y Quinto Real para el Estudio de la Delimitación con Notas Francesas de los años 1769-1776 / copiado en 25 de octubre de uno del E.M.S*] [Manuscript map], No scale given, 1769-1776. Centro Geográfico de Ejército (CGE) Ar.H-T.5-C.8-231.

Polt, John Herman Richard. "Jovellanos and His English Sources: Economic, Philosophical, and Political Writings." *Transactions of the American Philosophical Society* 54, no. 7 (1964): 1–74.

Porres Marijuán, Rosario, and Iñaki Reguera, eds. *La proyección de la monarquía hispánica en Europa: política, guerra y diplomacia entre los siglos XVI y XVIII*. Bilbao: Universidad del País Vasco, Servicio editorial = Eukal Herriko Unibertsitatea, Argitalpen Zertbitzua, 2009.

Portuondo, María M. "Cosmography at the Casa, Consejo, and Corte During the Century of Discovery." In *Science in the Spanish and Portuguese Empires, 1500-1800*, edited by Daniela Bleichmar, Paula De Vos, Krisitin Huffine, and Kevin Sheehan, 57–77. Stanford, Calif: Stanford University Press, 2009.

Portuondo, María M. "Lunar Eclipses, Longitude and the New World." *Journal for the History of Astronomy* 40, no. 3 (2009): 249–276.

———. *Secret Science: Spanish Cosmography and the New World*. Chicago: University of Chicago Press, 2009.

Pratt, Mary. *Imperial Eyes: travel writing and transculturation*. New York: Routledge, 1992.

Quiroz-Martínez, Olga. *La Introducción de la Filosofía Moderna en España: el Eclecticismo Español de los Siglos XVII y XVIII*. D.F., México: Colegio de México, 1949.

Randles, W.G.L. "Science et cartographie. L'image du monde physique a la fin du XVe siècle." In *El Tratado de Tordesillas y su Epoca: Congreso Internacional de Historia*, 2:935–941. Valladolid; Tordesillas; Setúbal: Junta de Castilla y León; V Centenario del Tratado de Tordesillas; Comemorações Descobrimentos Portugeses, 1995.

Real Academia de la Historia. *Diccionario geográfico-histórico de España, por la Real Academia de la Historia: Seccion II, comprende la Rioja ó toda la provincia de Logroño y algunos pueblos de la de Burgos*. Madrid: Imprenta de la viuda de Joaqín Ibarra, 1802.

Reguera Rodríguez, Antonio T. *Los geógrafos del Rey*. León: Universidad de León, 2010.

Reinhartz, Dennis. *The Cartographer and the Literati: Herman Moll and his intellectual circle*. Lewiston, N.Y.: E. Mellen Press, 1997.

Relacion de los Mojones [cono]cidos, y comunes que cir[cundan] terminos de los Montes llamados Alduides y al territorio de Rocesvalles y Valcaslos [Manuscript map], No scale given, 1775-1785. Centro Geográfico de Ejército (CGE) Ar.H-T.5-C.8-233.

Requena, Francisco de. *Mapa de una gran parte de la América meridional en que se comprende el país por donde ha de correr la línea divisioria que han de trazer las quartas partidas de límites española y portuguesa; para acompañar a la demostración que ha hecho el primer comisario español sobre que no deve subirse con las demarcaciones por el río Yapurá hasta encontrar lo alto de la cordillera de montes que median entre los ríos Orinoco y Amazonas, y sobre que no pertenecen las fortalezas de S. Md. San Carlos y San Felipe, en el río Negro, a la dominación portuguesa como pretende el comisario general de la misma nación* [Manuscript map], No scale given, 1781. Archivo Histórico Nacional Estado MPD.78.

———. *Mapa de una parte del América merydional, en que su manifiestan los países perternencientes al Nuevo Reino de Granada y Capitanía General de Caracas, de los dominios de nuestro mui Augusto Soberano, que confinan con los establecimientos de S.M. fidelísima. Para acompañar a la relación sobre las operaciones ejecutadas en la Demarcación de límites por la quarta partida de división.' 'Construido por el teniente coronel yngeniero ordinario, don Francisco Requena, primer comisario de la misma División, gobernador y comandante general de Maynas* [Manuscript map], No scale given, Río Marañón, Abril 1783. Archivo Histórico Nacional Estado MPD.77.

Requena, Francisco de. *Ilustrados y bárbaros: diario de la exploración de límites al Amazonas: 1782*. Edited by Manuel Lucena Giraldo. Madrid: Alianza Editorial, 1991.

Restall, Matthew. "Imperial Rivalries." In *Mapping Latin America*, edited by Jordana Dym and Karl Offen, 79–83. Chicago: The University of Chicago Press, 2011.

Rich, E. E. "The Hudson's Bay Company and the Treaty of Utrecht." *Cambridge Historical Journal* 11, no. 2 (January 1, 1954): 183–203.

Rigau-Pérez, José G. "Surgery at the Service of Theology: Postmortem Cesarean Sections in Puerto Rico and the Royal Cedula of 1804." *The Hispanic American Historical Review* 75, no. 3 (1995): 377–404.

Robinson, Arthur Howard, and Barbara Bartz Petchenik. *The Nature of Maps: essays toward understanding maps and mapping*. Chicago: University of Chicago Press, 1976.

Rodríguez, conde de Campomanes, Pedro. *Noticia geografica del reyno y caminas de Portugal. [Compiled by P. Rodríguez Campomanes.].* Madrid: En la Oficina de Joachin Ibarra, 1762.

Rosenthal, Earl. "Plus Ultra, Non plus Ultra, and the Columnar Device of Emperor Charles V." *Journal of the Warburg and Courtauld Institutes* 34 (1971): 204–228.

Rouse, Joseph. *Knowledge and Power: Toward a Political Philosophy of Science*. Ithaca: Cornell University Press, 1987.

Safier, Neil. "'Every day that I travel ... is a page that I turn': Reading and Observing in Eighteenth-Century Amazonia." *Huntington Library Quarterly* 70, no. 1 (March 2007): 103–128.

———. *Measuring the New World: Enlightenment Science and South America*. Chicago: University of Chicago Press, 2008.

———. "The Confines of the Colony: Boundaries, Ethnographic Landscapes, and Imperial Cartography in Iberoamerica." In *The Imperial Map: Cartography and the Mastery of Empire*, edited by James Akerman, 133–183. Chicago: University of Chicago Press, 2009.

Sahlins, Peter. *Boundaries: the making of France and Spain in the Pyrenees*. Berkeley: University of California Press, 1989.

Salazar, Luis María de. *Discurso sobre los progresos y estado actual de la hidrografía en España*. Madrid: Imprenta Real, 1809.

Saldaña, Juan José, ed. *Science in Latin America: A History*. Translated by Bernabé Madrigal. 1st ed. Austin: University of Texas Press, 2006. (accessed May 28, 2010).

Salmoral, Manuel Lucena. "Las expediciones científicas en la época de Carlos III (1759-1788)." In *La ciencia española en ultramar: actas de las I Jornadas sobre "España*

y las Expediciones Científicas en América y Filipinas", Ateneo de Madrid, [11 al 22 de marzo de 1991], edited by Alejandro Díez Torre, Tomás Mallo, and Daniel Pacheco Fernández, 49–63. Aranjuez: Doce Calles, 1991.

San Antonio Gómez, Carlos de, Francisco Manzano Agugliara, and Miguel Ángel León Casas. "Tomás López, un cartógrafo de gabinete del siglo XVIII: fuentes y método de trabajo." In *Actas y CD*. Seville, Spain, 2005.

San-Antonio-Gomez, C., C. Velilla, and F. Manzano-Agugliaro. "Tomas Lopez's Geographic Atlas of Spain in the Peninsular War: a methodology for determining errors." *Survey Review* 43, no. 319 (2011): 30–44.

Sánchez-Blanco, Francisco. *El absolutismo y las Luces en el reinado de Carlos III*. Madrid: Marcial Pons, 2002.

———. *La mentalidad ilustrada*. Madrid: Taurus, 1999.

Sanders, James E. *The Vanguard of the Atlantic World: creating modernity, nation, and democracy in nineteenth-century Latin America*. Durham: Duke University Press, 2014.

Sandman, Alison D. "Spanish Nautical Cartography." In *History of Cartography*, edited by John Brian Harley and David Woodward, 3:1095–1142. Chicago: University of Chicago Press, 1987.

Sandman, Alison. "Latitude, Longitude, and Ideas about the Utility of Science." In *Mas allá de la Leyenda Negra: España y la revolución científica/Beyond the Black Legend: Spain and the Scientific Revolution*, edited by Víctor Brotons and William Eamon, 371–381. Valencia: Instituto de Historia de la Ciencia y Documentación López Piñero; Universitat de Valéncia; C.S.I.C., 2007.

Santiago, Luciano P.R. "The Beginnings of Higher Education in the Philippines (1601-1772)." *Philippine Quarterly of Culture and Society* 19, no. 2 (June 1, 1991): 135–145.

Santos Puerto, José. "La Sinapia: luces para buscar la utopía de la ilustración." *Bulletin Hispanique* 103, no. 2 (2001): 481–510.

Schmidel, Ulrich. *Relatos de la conquista del Río de la Plata y Paraguay, 1534-1554*. Edited by Klaus Wagner. Madrid: Alianza Editorial, 1986.

Schurz, William Lytle. "The Royal Philippine Company." *The Hispanic American Historical Review* 3, no. 4 (November 1, 1920): 491–508.

Sellés, Manuel, José Luis Peset, and Antonio Lafuente, eds. *Carlos III y la ciencia de la ilustración*. Madrid: Alianza Editorial, 1988.

Shapin, Steven, and Simon Schaffer. *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*. Princeton, N.J.: Princeton University Press, 2011.

Shaw, Michael Crozier. "'El siglo de hazer caminos': Spanish Road Reforms During the Eighteenth Century. A survey and Assessment." *Dieciocho: Hispanic enlightenment* 32, no. 2 (2009): 413–434.

Smith, Thomas R. "Cruz Cano's map of South America, Madrid, 1775: its creation, adversities and rehabilitaion." *Imago Mundi* 20 (1966): 49–78.

Snyder, John P. "The Transverse and Oblique Cylindrical Equal-Area Projection of the Ellipsoid." *Annals of the Association of American Geographers* 75, no. 3 (September 1985): 431–442.

Socolow, Susan. *The Merchants of Buenos Aires, 1778-1810: family and commerce*. New York: Cambridge University Press, 1978.

Solari, Manuel Horacio. *Historia de la educación argentina*. Buenos Aires: Editorial Paidós, 1972.
Soler Pascual, Emilio. *Viajes de Jorge Juan y Santacilia: ciencia y política en la España del siglo XVIII*. Barcelona: Ediciones B, 2002.
Soll, Jacob. "Healing the Body Politic: French Royal Doctors, History, and the Birth of a Nation 1560-1634." *Renaissance Quarterly* 55, no. 4 (2002): 1259–1286.
Souto, José Manuel. *El siglo XVIII español: cultura, ciencia y filosofía*. Madrid: Mileto Ediciones, 2004.
Spence, Ian, and Howard Wainer. "William Playfair and His Graphical Inventions: An Excerpt from the Introduction to the Republication of His 'Atlas' and 'Statistical Breviary'." *The American Statistician* 59, no. 3 (August 1, 2005): 224–229.
Stein, Stanley J., and Barbara H. Stein. *Apogee of Empire: Spain and New Spain in the Age of Charles III, 1759-1789*. Baltimore: Johns Hopkins University Press, 2003.
———. *Silver, Trade, and War: Spain and America in the Making of Early Modern Europe*. Baltimore: Johns Hopkins University Press, 2000.
Taton, Juliette. "Anville, Jean-Baptiste Bourguignon D'." *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.
Terrall, Mary. *The Man Who Flattened the Earth: Maupertuis and the Sciences in the Enlightenment*. Chicago: University of Chicago Press, 2002.
The HarperCollins Study Bible: New Revised Standard Version, with the Apocryphal/Deuterocanonical Books. 1st ed. New York, NY: HarperCollins, 1993.
"The Story of the First Charts, in Three Charts." *Harvard Business Review* 92, no. 6 (June 2014): 32–33.
Thompson, I.A.A. "Castile, Spain and the Monarchy: the political community from 'patria natural' to 'patria nacional'." In *Spain, Europe and the Atlantic World: Essays in honour of John H. Elliott*, edited by Richard Kagan and Geoffrey Parker, 125–159. Cambridge: Cambridge University Press, 2002.
Thrower, Norman J.W. "Longitude in the Context of: Cartography." In *The Quest for Longitude: The Proceedings of the Longitude Symposium, Harvard University, Cambridge, Massachusetts, November 4-6, 1993*, edited by William J. H Andrewes, 49–62. Cambridge, Mass: Collection of Historical Scientific Instruments, Harvard University, 1996.
Tofiño de San Miguel, Vincente. *Atlas Marítimo de España*. Madrid, 1789.
Tomás, José Pardo, and Àlvar Martínez Vidal. "Las consultas y juntas de médicos como escenarios de controversia científica y práctica médica en la época de los novatores (1687-1725)." *Dynamis: Acta Hispanica ad Medicinae Scientiarumque Historiam Illustrandam* 22 (June 3, 2008): 303–325.
Uztáriz, Gerónimo de. *The Theory and Practice of Commerce and Maritime Affairs*. London: Printed for J. & J. Rivington, and J. Crofts, 1751.
Valverde, Nuria, and Antonio Lafuente. "Space Production and Spanish Imperial Geopolitics." In *Science in the Spanish and Portuguese Empires, 1500-1800*, edited by Daniela Bleichmar, Paula De Vos, Krisitin Huffine, and Kevin Sheehan, 198–215. Stanford, Calif: Stanford University Press, 2009.
Vargas Ponce, José. *Apéndice a la Relacion del viage al Magallanes de la fragata de guerra Santa María de la Cabeza, que contiene el de los paquebotes Santa Casilda y Santa Eulalia para completar el reconocimiento del estrecho en los años de 1788*

y 1789. Trabajado de orden superior. Madrid: Impr. de la viuda de D. J. Ibarra, 1793.

———. *Relacion del último viage al Estrecho de Magallanes de la fragata de S.M. Santa María de la Cabeza en los años de 1785 y 1786. Extracto de todos los anteriores desde su descubrimiento impresos y mss. y noticia de los habitantes, suelo, clima y producciones del estrecho. Trabajada de orden del Rey*. Madrid: Por la viuda de Ibarra, hijos y compañia, 1788.

Vázquez de Acuña, Isidoro. "Las Exploraciones del Estrecho de Magallanes por el Capitán de Navío Don Antonio de Córdoba y Lasso de la Vega su primer viaje (1785-1786); su segundo viaje (1788-1789)." *Revista de historia naval* 22, no. 84 (2004): 7–26.

Vega, José. *Limites de España y Francia segun el tratado de 1785* [Manuscript map], No scale given, Madrid, 1785. Cartoteca, Centro Geográfico de Ejército Ar.H-T.5-C.8-249.

Venturi, Franco. *Utopia and Reform in the Enlightenment*. Cambridge: Cambridge University Press, 1971.

Vernet, J. "Mutis y Bossio, José Celestino Bruno." *Complete Dictionary of Scientific Biography*. Detroit, Mich.: Charles Scribner's Sons, 2008.

Vicente Maroto, M. I., and Mariano Esteban Piñeiro. *Aspectos de la ciencia aplicada en la España del siglo de oro*. Salamanca: Junta de Castilla y León, Consejería de Cultura y Turismo, 1991.

Vico, Giambattista. *Scienza nuova seconda (1730/1744), The New Science of Giambattista Vico*. Translated by Thomas Goddard Bergin and Max Harold Fisch. Ithaca: Cornell University Press, 1984.

———. *Vita di Giambattista Vico scritta da se medesimo (1725-31), The Autobiography of Giambattista Vico with the Continuation by Villarosa [1818]*. Translated by Thomas Goddard Bergin and Max Harold Fisch. Ithaca: Cornell University Press, 1975.

Villa, Antonio Rodriguez. *Don Cenon de Somodevilla, marqués de la Ensenada*. Madrid: Librería de M. Murillo, 1878.

Vives, Jaime Vicens. *Manual de historia económica de España*. Barcelona: Editorial Vicens-Vives, 1970.

Vogel, Klaus A. "Cosmography." In *The Cambridge History of Science*, edited by Katherine Park and Lorraine Daston, 3:469–496. Cambridge: Cambridge University Press, 2006. https://catalyst.library.jhu.edu/catalog/bib_4394924.

Voltaire. *A Philosophical Dictionary*. Vol. 3. London: John and Henry L. Hunt, 1824.

Weber, David J. *Bárbaros: Spaniards and their Savages in the Age of Enlightenment*. New Haven: Yale University Press, 2005.

Wey Gómez, Nicolás. *The Tropics of Empire: Why Columbus Sailed South to the Indies*. Cambridge, Mass: MIT Press, 2008.

White, Hayden. "The Tropics of History: the Deep Structure of the New Science." In *Tropics of Discourse: Essays in Cultural Criticism*, 197–217. Baltimore: Johns Hopkins University Press, 1985.

———. *Tropics of Discourse: Essays in Cultural Criticism*. Baltimore: Johns Hopkins University Press, 1985.

Wilson, Arthur McCandless. *French Foreign Policy During the Administration of Cardinal Fleury, 1726-1743: a study in diplomacy and commercial development*. Cambridge: Harvard University Press, 1936.
Wing, John T. "Spanish Forest Reconnaissance and the Search for Shipbuilding Timber in an Era of Naval Resurgence, 1737-1739." *Journal of Early Modern History* 18, no. 4 (2014): 357–382.
Wing, John Thomas. "Roots of Empire: state formation and the politics of timber access in early modern Spain, 1556--1759". Ph.D. Dissertation, University of Minnesota, 2009.
Wolf, John B. *Louis XIV*. New York: Norton, 1968.
Wolfart, Philip D. "Mapping the Early Modern State: the work of Ignaz Ambros Amman, 1782-1812." *Journal of Historical Geography* 34, no. 1 (2008): 1–23.
Wood, Denis. "The Map as a Kind of Talk: Brian Harley and the Confabulation of the Inner and Outer Voice." *Visual Communication* 1, no. 2 (June 1, 2002): 139–161.
Wright, John. "Terrae Incognitae: The Place of the Imagination in Geography." *Annals of the Association of American Geographers* 37, no. 1 (1947): 1–15.
Wulf, Andrea. *The Invention of Nature: Alexander von Humboldt's New World*. New York: Alfred A. Knopf, 2015.
Yeo, Richard. "Classifying the Sciences." In *The Cambridge History of Science*, edited by Roy Porter, 239–266. Cambridge: Cambridge University Press, 2003.
Zimmer, Karl S. "Mapping Mountains." In *Mapping Latin America*, edited by Jordana Dym and Karl Offen, 125–130. Chicago: The University of Chicago Press, 2011.

Curriculum Vitae

Matthew E. Franco was born January 2, 1985 in Boston, Massachusetts. He graduated from Wesleyan University in Middletown, Connecticut in 2007, receiving a Bachelor of Arts in both Mathematics and History (Honors). From 2007 to 2009, Matthew taught mathematics at the Kingswood-Oxford School in West Hartford, Connecticut. Matthew earned a Doctor of Philosophy from the Department of the History of Science and Technology at the Johns Hopkins University in 2016, and a Master of Arts from the same department in 2011. During the 2015-2016 academic year, Matthew served as Adjunct Professor of History at Mount St. Mary's University in Emmitsburg, Maryland.